APRIL, 1955

TOOLING and PRODUCTION

The Magazine of Manufacturing Management

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by Henry D. Sharpe

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Arbor for
Taper Bored Parts

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NEWS
f People, Products,
nts and Processes

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BPA

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WHISTLER
10 HOLE
MAGNETIC
PERFORATING
DIE

Cut die costs drastically, start production quicker!

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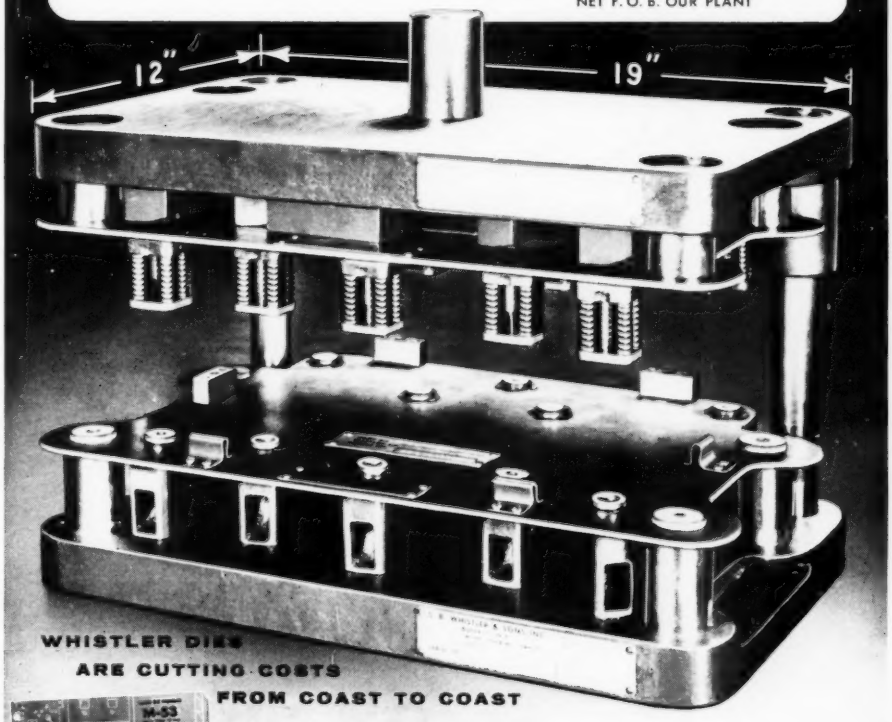

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FROM COAST TO COAST

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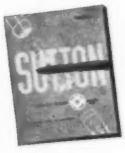

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TOOLING and PRODUCTION

The Magazine of Manufacturing Management

formerly Tool-Die-Machine PROGRESS 1934-1941
TOOL & DIE JOURNAL 1941-1951

George J. Huebner, Founder

VOL. XXI—No. 1 APRIL, 1955

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Every copy is directed to these men by name, by title and by company address. Please see our BPA verification.

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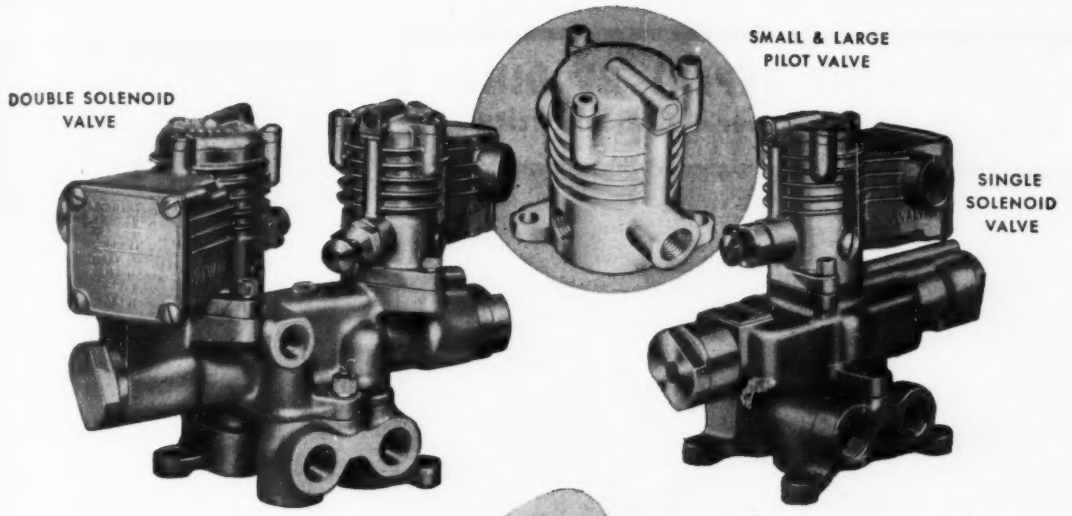

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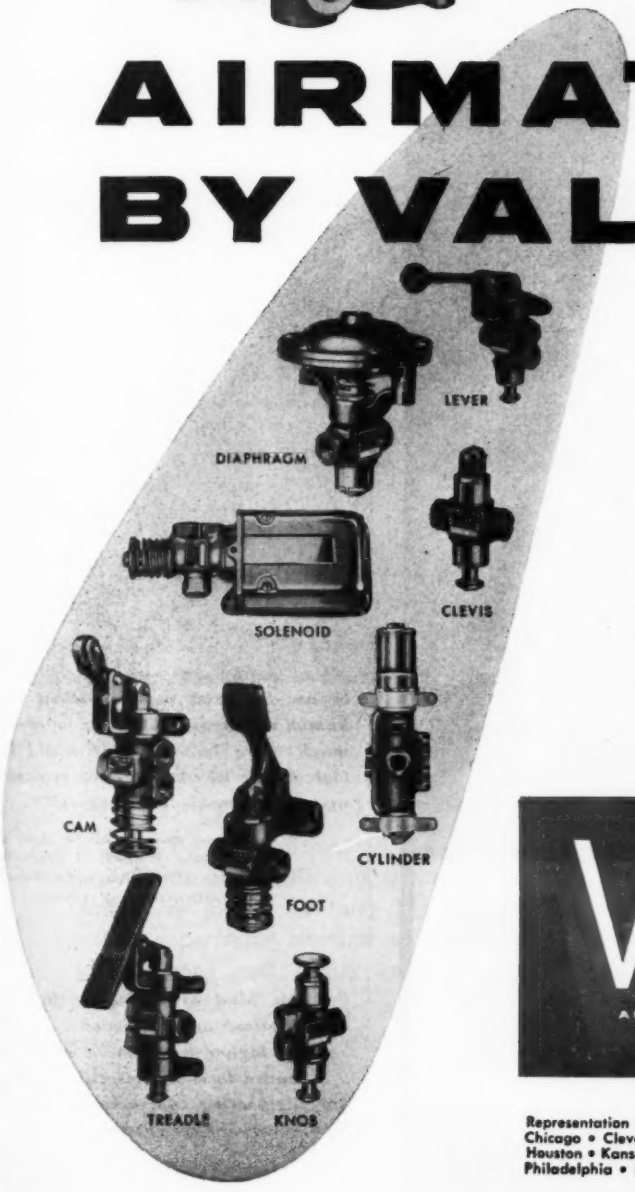

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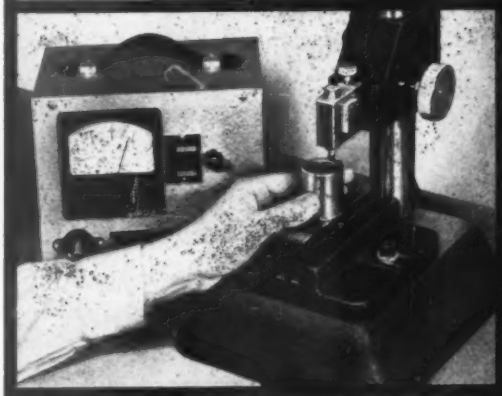
CIRCLE INFORM-A-GRAM KEY NO. 5

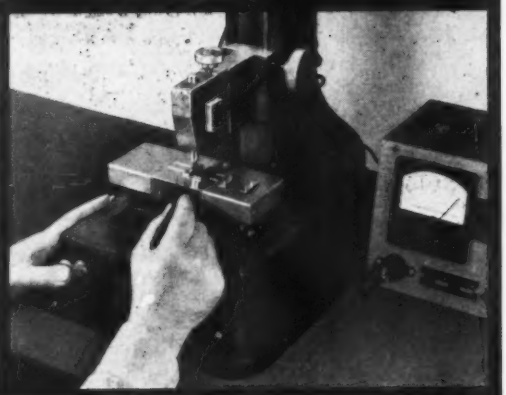
For CONSISTENT REPEAT READINGS of Size — Runout — Taper — Concentricity . .

INDI-AC Electronic Indicator, for all-around surface plate work and for checking setups and runout on the machine. Reads .0005"/.000050" or .0001"/.000010" per scale division.



PAR-AC Electronic Production Gage, for high-precision repetitive gaging in the shop or inspection department. Reads .0005"/.000050" or .0001"/.000010" per scale division.

MICRO-AC Electronic Microcomparator, for gage room use and ultra-precision production gaging. Reads .000010"/.000001" per scale division — or .000001"/.0000005"



These gages are *stable* and *friction-free* — give *consistent repeat readings*. ● They are used with a recorder to provide a *pen-drawn record* of runout, size deviations, etc. ● Gage heads and amplifiers are used with *special fixtures* — and for *automation* applications. ● BULLETIN 542 describes the equipment — tells how it works — shows numerous applications. May we send you a copy? Write —

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CIRCLE INFORM-A-GRAM KEY NO. 6

"Commendable Comments"

"It is difficult to put a price tag on automation in the metalworking industry or to fit it into a time table. Complete automatic production will be accomplished in steps. Each step will mean new business for equipment builders and new opportunities for cost reduction by users."

—K. M. Patterson, Westinghouse Electric Corp. Address to the Industrial Heating Equipment Association, Detroit.

"A serious shortage of skilled men in the tool and die business does exist—and will grow more critical unless more apprentices are trained."

—George S. Eaton, Executive Secretary, NTDMA Association. Winter Meeting, Los Angeles.

"Automatic factories will increase the need for skilled technicians and the facilities to create and maintain them."

—Harold G. Murdock, Vice President, Arrowsmith Tool & Die Corp. NTDMA Association. Winter Meeting, Los Angeles.

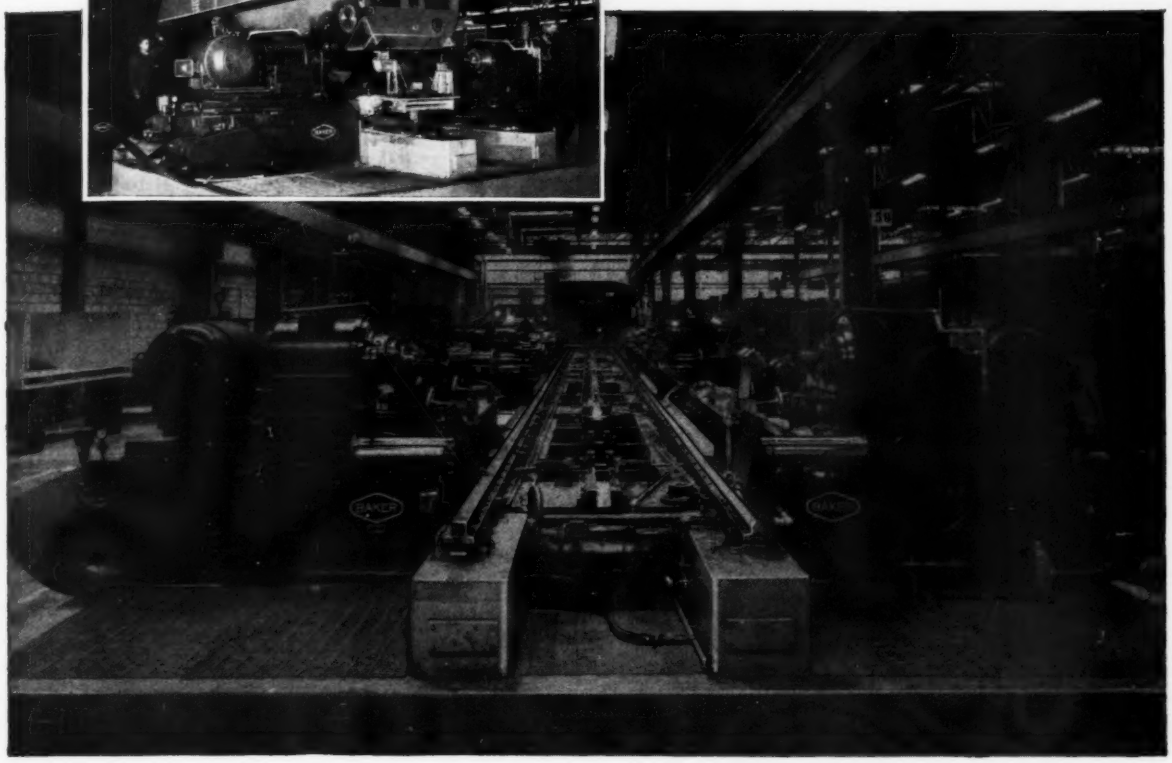
"We know a great deal about the supply of our natural resources, but less, in an organized manner, about our human resources. Since the latter are much more important, it would be logical that we should have accurate, up-to-date knowledge of them."

—Address presented by Dr. John T. Rettaliata, President of Illinois Institute of Technology, to the Military-Industrial Conference, Chicago.

"A new kind of technician for our 'push-button' age is needed . . . will require higher engineering education . . . entire level of scientific training for engineering and maintenance personnel must be raised materially."

—H. Leslie Hoffman, Electronics Chairman, Los Angeles Chamber of Commerce, commenting on the 2nd Western Plant Maintenance and Engineering Show.

New BAKER Automatic MACHINES 15,000 lb. TANK HULL as it passes along 100 FOOT RAILS!



OPERATIONS: DRILLING . . . TAPPING . . . BORING . . . FACING on 102 holes . . .

10 main bores Mounted on a specially-built floating concrete slab, this huge new Automatic Baker Transfer Machine accurately performs multiple drilling, tapping, boring and facing operations on 15,000 pound rough weldments 9 feet wide and 16 feet long. Savings achieved in production costs with a machine of this type are tremendous. Baker engineering know-how stands ready to solve your production problems . . . with cost cutting standard or special, single or multi-operation machines.

Write regarding your specific job problems . . .

BAKER BROTHERS, INC. Toledo, Ohio

DRILLING...TAPPING.., KEYSEATING and CONTOUR GRINDING MACHINES

CIRCLE INFORM-A-GRAM KEY NO. 7

What one tube steel will give you the best life/cost ratio? *Ask the experts!*

This month's report is on: **DM STEEL**

Has unusually high creep strength for a pearlitic steel, good stability up to 1200° F., fairly good corrosion and oxidation resistance. Has 2 to 3 times the life of carbon steel where corrosion is not severe. Recommended for cracking furnace tubes, hot oil lines, superheater tubes, high temperature steam piping and forgings for accessory parts.

ONE OF 24 TIMKEN HIGH TEMPERATURE STEELS

Carbon	Sicromo 2	Sicromo 5S	18-8 Ti
Carbon-Mo.	Sicromo 2½	Sicromo 5MS	16-13-3
DM-2	2½% Cr.-1% Mo.	Sicromo 7	25-20*
Silmo	Sicromo 3	Sicromo 9M	25-12*
DM	4-6% Cr.-Mo.	18-8 Stainless	35-15**
2% Cr.-Mo.	4-6% Cr.-Mo.-Ti.	18-8 Cb	16-25-6**

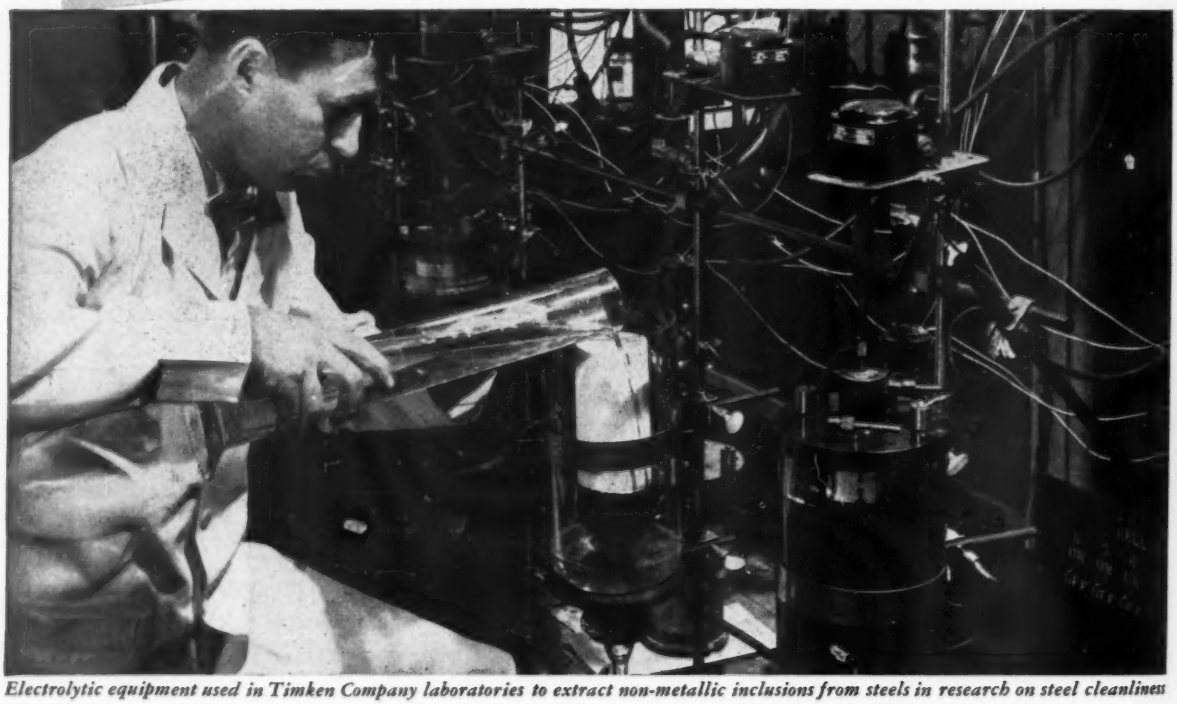
**Available as seamless tubing on an experimental basis only.*
***Not available as seamless tubing.*

THERE are probably several high temperature tube steels that will solve your heat, pressure, corrosion and oxidation problems. But there's only one analysis that will give you maximum tube life per dollar.

To find it, *ask the experts!*

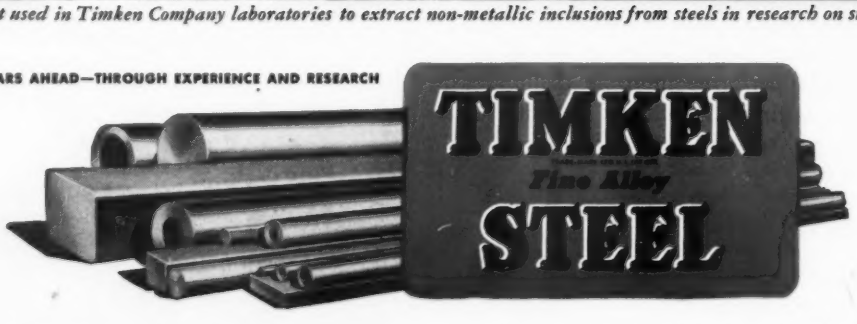
With over 20 years of steel research and experience, Timken Company metallurgists are recognized authorities on high temperature steels. They'll use this experience to help you select from 24 different analyses, pick the one tube steel that will give you the best life/cost ratio. And regardless which analysis you select, you'll be assured of uniform quality because the Timken Company rigidly controls quality from melt shop through final inspection.

Let the Timken Company's RSQ—Research, Supply, Quality—solve your tube problems. *Ask the experts!* The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".



Electrolytic equipment used in Timken Company laboratories to extract non-metallic inclusions from steels in research on steel cleanliness

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH



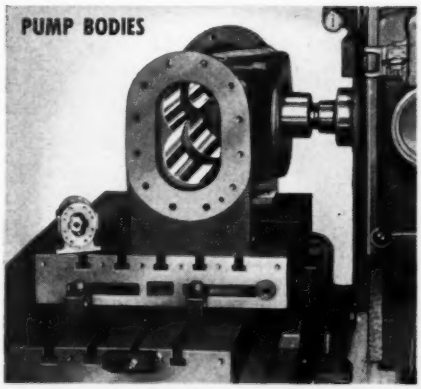
SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING

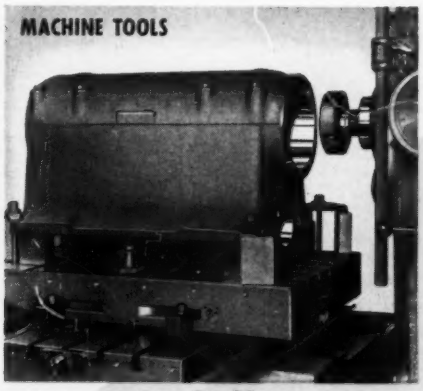
CIRCLE INFORM-A-GRAM KEY NO. 8

The DeVlieg System of

*JIGLESS PRODUCTION

. . . eliminates expensive boring jigs!





TYPICAL EXAMPLES OF JIGLESS PRODUCTION ON DE VLIEG JIGMILS

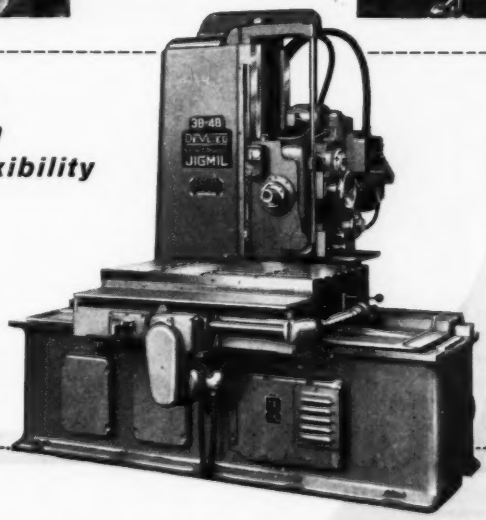
The JIGMIL Technique:

- ELIMINATES SPECIAL BORING JIGS
- REDUCES MACHINING TIMES
- PERMITS USE OF SIMPLIFIED TOOLING
- IMPROVES ACCURACY WITH RESULTANT CUT IN ASSEMBLY COSTS

The DeVlieg System of Jigless Production permits complete flexibility of product design!

If your shop is burdened with costly boring jigs and special tooling, it will pay you to investigate the

DE VLIEG *SPIRAMATIC* JIGMIL



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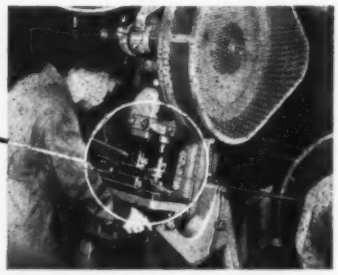
money saving

Accessories for your plant

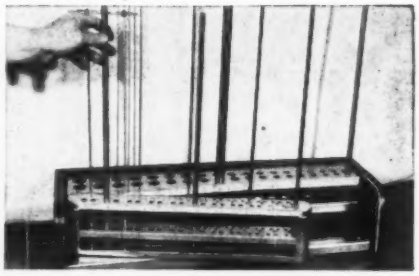
Each of the accessories illustrated and described below was designed and built for a definite need and used in our own plant before being offered to industry. They require a relatively small investment, yet will save you money every day. For further information, write for the folder offered below.

LEADER PIN OILERS



Eliminate wear on your die sets with these leader pin oilers. Acro Pin Oilers, as illustrated, fit over each leader pin and seals in place with a rubber neoprene washer. Each cup is filled with oil so each downward stroke brings bushing in contact with oil and each upward stroke distributes oil evenly over leader pins. Eliminate bushing wear, leader pin scoring, and maintain die accuracy. Die sets equipped with Acro Pin Oilers have run under tests for several weeks to a month without refilling.

DRILL ROD RACKS

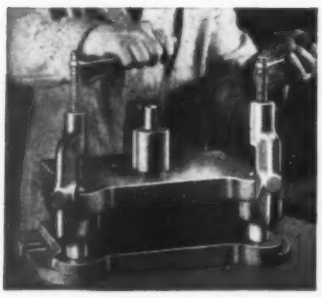


Eliminate trouble and waste effort with this modern method of storing drill rod. Put the Acro rack in a central location of each department and make it simple for each mechanic to select correct rod size in a hurry. It also provides a visual inventory for checking rod replacements.

Accommodates 26 letter sizes, 52 pieces; 47 fractional sizes, 138 pieces; 60 number sizes, 304 pieces. Fractional sizes graduated in 64ths from 1/32" to 1/2" and in 32nds from 1/2" to 1" included.

Also available in half size with fractions or numbers.

DIE SET PULLERS



The principle of the Acro Die Set Puller is to remove the punch holder from the die shoe by a straight upward pull, whereby punch holder travels upward from die shoe axially, leaving both leader pins simultaneously. This is accomplished only by use of the indexed screw wrenches which act as indicators, controlling the upward travel. This is an exclusive patented Acro feature, found only in Acro Die Set Pullers. Available in three sizes.

Free Data

covering each of these profitable accessories is included in our folder. Write for bulletin TP-53

ACRO

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engineers and manufacturers of production machines and drilling equipment

CIRCLE INFORM-A-GRAM KEY NO. 11

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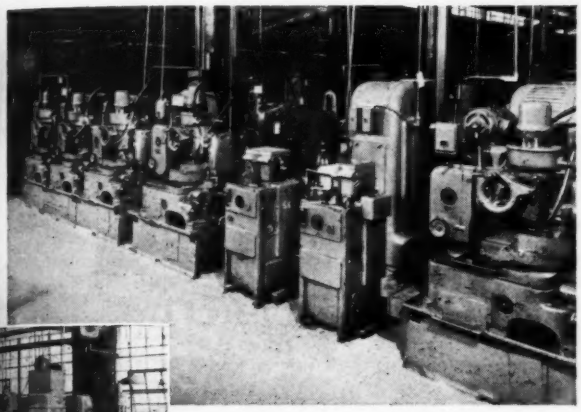
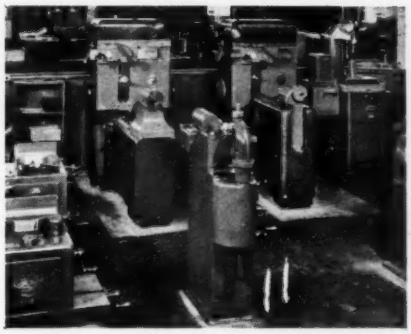
18 GEAR SHAPERS start with a pair of late model 36-Type Machines and run down the size range to two modern 3-Inch Fine-Pitch Machines

THE Fellows EAR

esatility

The Steel Products Engineering Co., Springfield, Ohio pins its faith to FELLOWS gear production equipment FOR ALL SIZE CLASSIFICATIONS





7 FELLOWS GEAR INSPECTION INSTRUMENTS include Red Liners and Involute Measuring Instruments

Equipped with Fellows Gear Shapers of different sizes ranging in capacity from 3″ up to 36″ along with Fellows Inspection Instruments for checking gear profiles, tooth accuracy, etc.... this well organized precision shop can profitably handle jobs in *all* size classifications. They cut fine instrument gears of Aircraft Quality... small and large diameter internal gears... cams, ratchet teeth, interrupted profiles, segment gears, and many unusual contours possible only with the Fellows Method.

In addition to the versatility of Fellows Gear Shapers, another feature that pays off for Steel Products is the quick and easy change-over from one job to another on these machines... a very important cost factor when frequent job changes and both long and short runs are involved.

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CIRCLE INFORM-A-GRAM KEY NO. 13

STANDARD
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POUGHKEEPSIE, N.Y. U.S.A.
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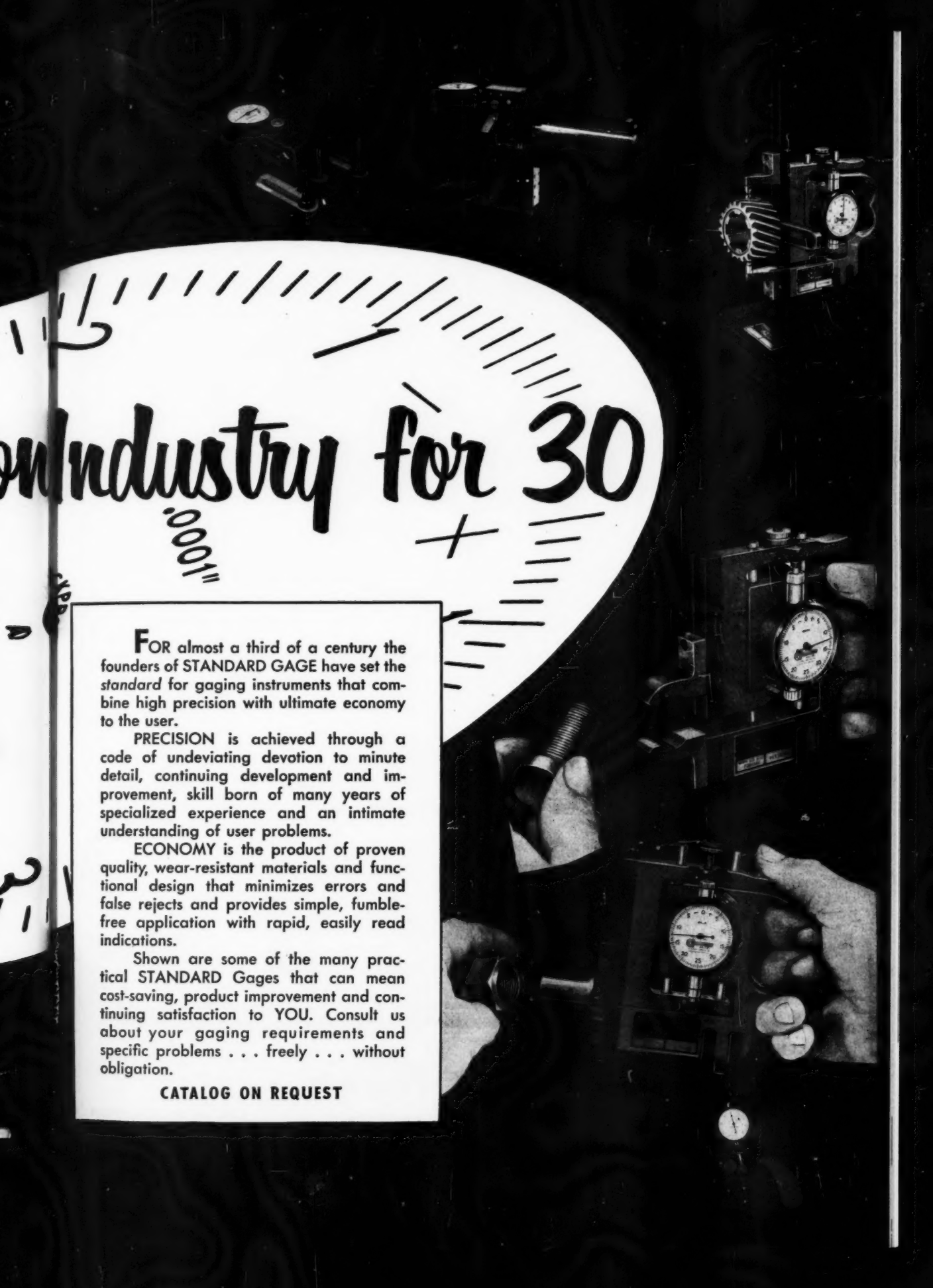


FOR almost a third of a century the founders of STANDARD GAGE have set the *standard* for gaging instruments that combine high precision with ultimate economy to the user.

PRECISION is achieved through a code of undeviating devotion to minute detail, continuing development and improvement, skill born of many years of specialized experience and an intimate understanding of user problems.

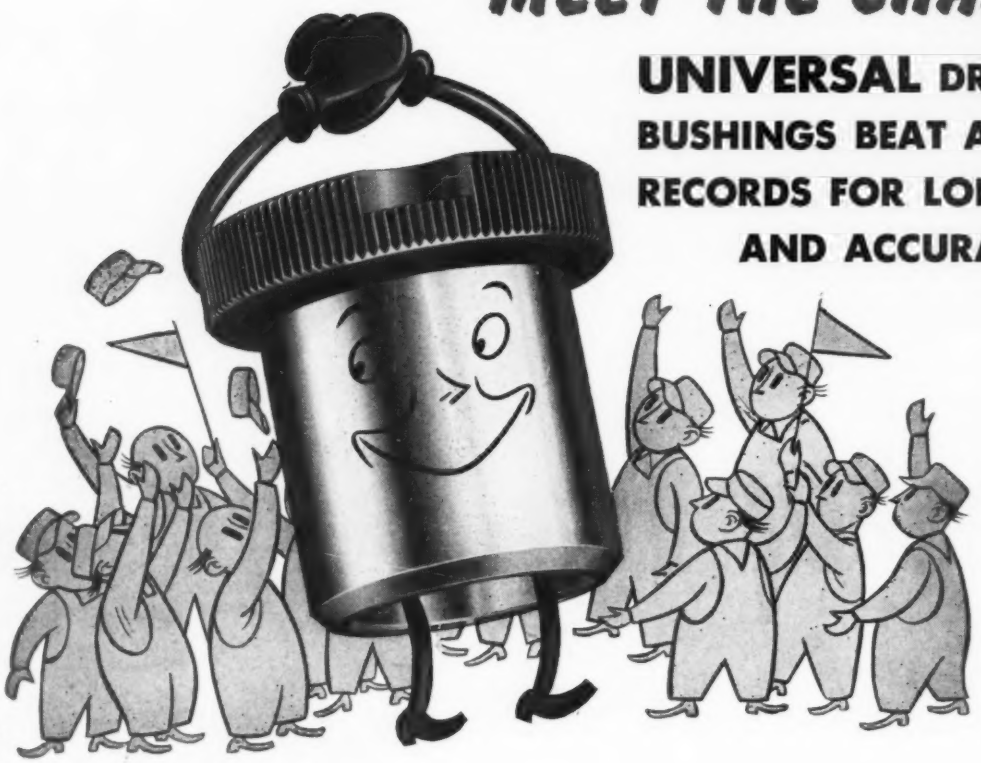
ECONOMY is the product of proven quality, wear-resistant materials and functional design that minimizes errors and false rejects and provides simple, fumble-free application with rapid, easily read indications.

Shown are some of the many practical STANDARD Gages that can mean cost-saving, product improvement and continuing satisfaction to YOU. Consult us about your gaging requirements and specific problems . . . freely . . . without obligation.

CATALOG ON REQUEST

MEET THE CHAMP!

UNIVERSAL DRILL BUSHINGS BEAT ALL RECORDS FOR LONG LIFE AND ACCURACY



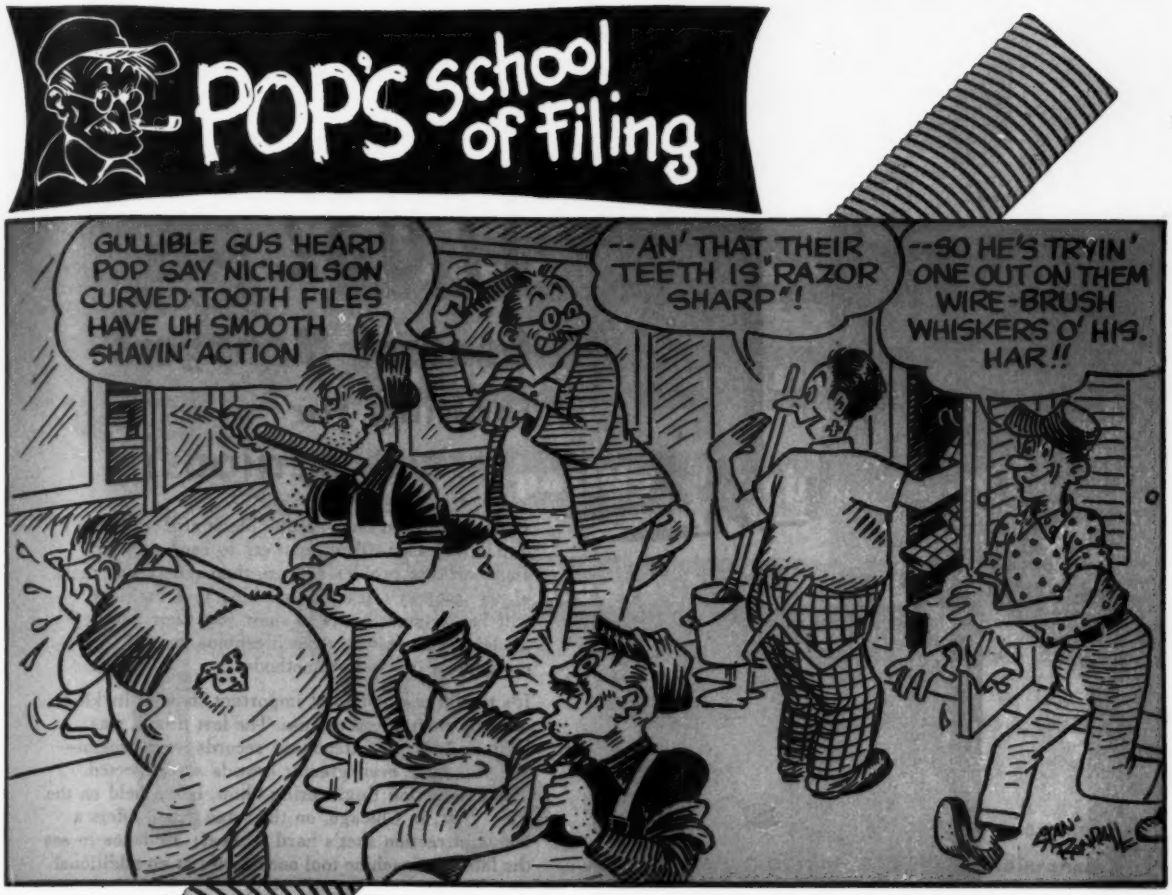
The extremely long life of Universal Drill Bushings is due to several factors. They are machined from finest quality steel. Their superhoned bores help to reduce both wear of the bushing and wear of the tools. Blended radius on the top inside diameter helps prevent tool hang-up and breakage. 100% concentricity and hardness tests insure accuracy and uniform quality. Knurled heads provide a quick, sure grip. Available in a complete range of standard sizes and lengths. Orders for special dimensions will receive prompt attention. For complete information, write to the office nearest you—Universal Engineering Sales Co., 1060 Broad St., Newark 2, N. J.; 5035 Sixth Ave., Kenosha, Wis.—or our home office.

179

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 8
MICHIGAN

1 STANDARD COLLET CHUCK
2 FLOATING COLLET CHUCK
3 BORING CHUCK
4 "KWIK-SWITCH" TOOL HOLDER
5 MIKRO-LOK BORING BAR
6 STANDARD DRILL BUSHING
7 UNIVERSAL INDEX PLUNGER

CIRCLE INFORM-A-GRAM KEY NO. 16


POP'S school of filing
GULLIBLE GUS HEARD POP SAY NICHOLSON CURVED-TOOTH FILES HAVE UH SMOOTH SHAVIN' ACTION
--AN' THAT THEIR TEETH IS "RAZOR SHARP"!
--SO HE'S TRYIN' ONE OUT ON THEM WIRE-BRUSH WHISKERS O' HIS. HAR!!
NICHOLSON U.S.A. SUPERIOR

Even so, Gus isn't far off the beam. Curved Tooth files in the Nicholson Superior brand have a shearing or "shaving" action that is marvelously fast and smooth cutting on sheet and annealed tool steels, cast iron, brass, bronze, aluminum, magnesium, plastics, etc.

Their high efficiency and savings in workmen's time are brought about by such minutely developed technical features as these:

Teeth have just the right face angle for good bite, and gullets are smoothly rounded to minimize clogging when used on soft or ductile materials.

Teeth of almost unbelievable sharpness are *milled* in (not chisel-cut) with specially designed machines.

Teeth have just the right radius and spacing to keep at least two teeth in "non-chatter" contact with the work along any one line.

Nicholson Superiors come in a full range of popular types and shapes: Rigid and Flexible; tanged and holed; Flat, Pillar, Square, Shell and Moulding—for wide and narrow surfaces, for concavities and for convexities. For a wide range of uses, *there's nothing like Curved Tooth files and no brand like Nicholson Superior.*

BUY FROM YOUR INDUSTRIAL DISTRIBUTOR

NICHOLSON U.S.A.

NICHOLSON FILE CO. • 95 ACORN STREET, PROVIDENCE 1, RHODE SLAND

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ont.)

BLACK DIAMOND MADE IN U.S.A.

NICHOLSON . . . A FILE FOR EVERY PURPOSE

CIRCLE INFORM-A-GRAM KEY NO. 17

17,032*

General Managers looking for BETTER METHODS!

Plan *now* to join them—at the Machine Tool Show. You'll find a wealth of answers to each of your metalworking problems. More than ninety per cent of the country's leading machine tool builders will be on hand, ready to show you their newest models, their fastest, most ingenious, most economical production methods.

It's the largest and most important show of its kind; one you can't afford to miss. The last time it was held, in 1947, all attendance records were broken—and this time even greater crowds are expected. The Production Engineering Show, being held on the Navy Pier, in Chicago, on the same dates, offers a bonus attraction that's hard to beat; a chance to see the latest in machine tool accessories at no additional cost. The same badge will admit you to both shows.

Bring your key production people to Chicago in September; share with them this unequaled opportunity to see the latest developments in machine tools. The 1955 Machine Tool Show is the best chance you've ever had to see **the world's best investment—*in action!***

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
2071 East 102 Street • Cleveland 6, Ohio

*** Estimated Attendance, Before Receiving *Your* Reservation**

CIRCLE INFORM-A-GRAM KEY NO. 18

WEJ-LOK

a new and different tool holder

of rugged design, simple to use,

positive locking and

universal application

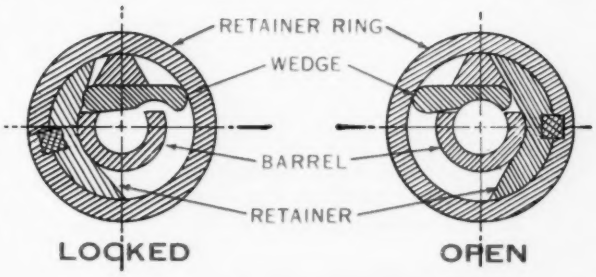
A simple hand spinning of the Wej-Lok retainer ring locks or unlocks inserted tools. Yet, either left or right-hand cutting tools are firmly held by this accurately machined tool holder.

In locked position, the flat surface of holder wedge is tightly seated in mating notched section of tool shank. Normal operating torque tends to further tighten this wedging action, thus, preventing all possibility of tool play or wobble. Where unusually large tools or extra heavy cutting operations are required, provision is made on the holder for use of a Baker drive to augment wedge locking and assure utmost stability.

Wej-Lok tool holder permits universal usage . . . grinding a simple flat area on any tool shank to match holder wedge provides positive locking. You will find Wej-Lok superior in every respect on all drilling, reaming, boring and milling operations.

Note these unusual Wej-Lok features:

1. Shank and barrel machined from one piece.
2. Accurately machined to exacting tolerances.
3. Finest quality hardened steel used in all parts.
4. Long-life through elimination of wear areas.
5. Positive wedge type locking of tools.
6. Wedge lock plus Baker drive on larger tools.
7. Simple insertion and removal of tools.
8. Can be used for right or left-hand cutting tools.
9. All tools quickly ground for use in holder.
10. Designed for standard straight shank end mills.



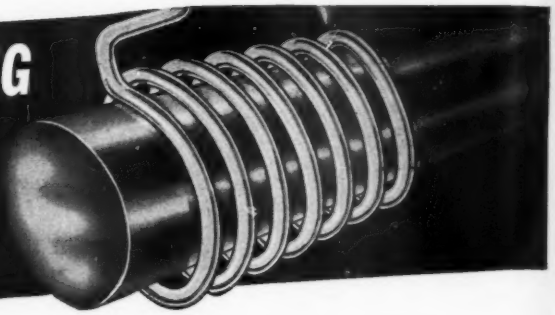
DETROIT REAMER & TOOL CO.

2830 EAST SEVEN MILE ROAD • DETROIT 34, MICHIGAN

D R & T COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 19

YOU CAN HEAT ANYTHING
FROM A NEEDLE . . . TO
A TURBINE SHAFT
FASTER and BETTER



WITH Lepel

HIGH FREQUENCY *Induction* HEATING UNITS

BRAZING
Permits widest choice of silver or copper brazing alloys from lowest to highest melting points. Ideal for brazing carbide tips.

HARDENING
Heat localized exactly where wanted at desired temperature. Ideal for gears, cams, bearing surfaces, cutting tools and other areas that are subject to wear.

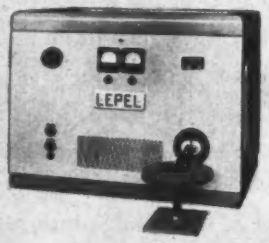
SOLDERING
Speedily and neatly performs intricate soldering applications with or without the use of preformed rings.

ANNEALING
Ideal for annealing, stress-relieving, normalizing or preheating selected areas.

MELTING
Readily melts quantities of ferrous and non-ferrous metals in either graphite or ceramic crucibles.

The Lepel line of induction heating units represents the most advanced thought in the field of electronics as well as the most practical and efficient source of heat yet developed for industrial heating. With a background of half a century of electrical and metallurgical experience, the name Lepel has become the symbol for quality in induction heating equipment embodying the highest standards of engineering achievement, dependable low cost operation and safety.

If you are interested in the application of induction heating you are invited to send samples of the work with specifications of the operations to be performed. Our engineers will process these samples and return the completed job with full data and recommendations without any cost or obligation.



2½ KW INDUCTION HEATING UNIT

30 KW INDUCTION HEATING UNIT

100 KW INDUCTION HEATING UNIT

LEPEL Electronic Tube GENERATORS
1 KW; 2½ KW; 5 KW; 10 KW; 20 KW;
30 KW; 50 KW; 75 KW; 100 KW.

LEPEL Spark Gap Converters
2 KW; 4 KW; 7½ KW; 15 KW; 30 KW.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

WRITE FOR THE NEW LEPEL CATALOG . . . 36 illustrated pages packed with valuable information on high frequency induction heating.

LEPEL HIGH FREQUENCY LABORATORIES, INC.
55th STREET and 37th AVENUE, WOODSIDE 77, NEW YORK CITY, N. Y.

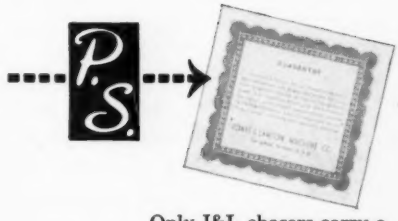
CIRCLE INFORM-A-GRAM KEY NO. 20

What was your chaser cost last year?

Check your figures . . . the total may surprise you.

Jones & Lamson Dies and Chasers will reduce these costs. Our system of "no approximations" insures at least 20 controlled resharpenings with every set of tangent chasers . . . and you get the fastest job changeover of any tangent die . . . *without* extra equipment. You change only the chasers . . . not the holders.

Each set of J&L chasers is engineered specifically to do each job in the most economical way.



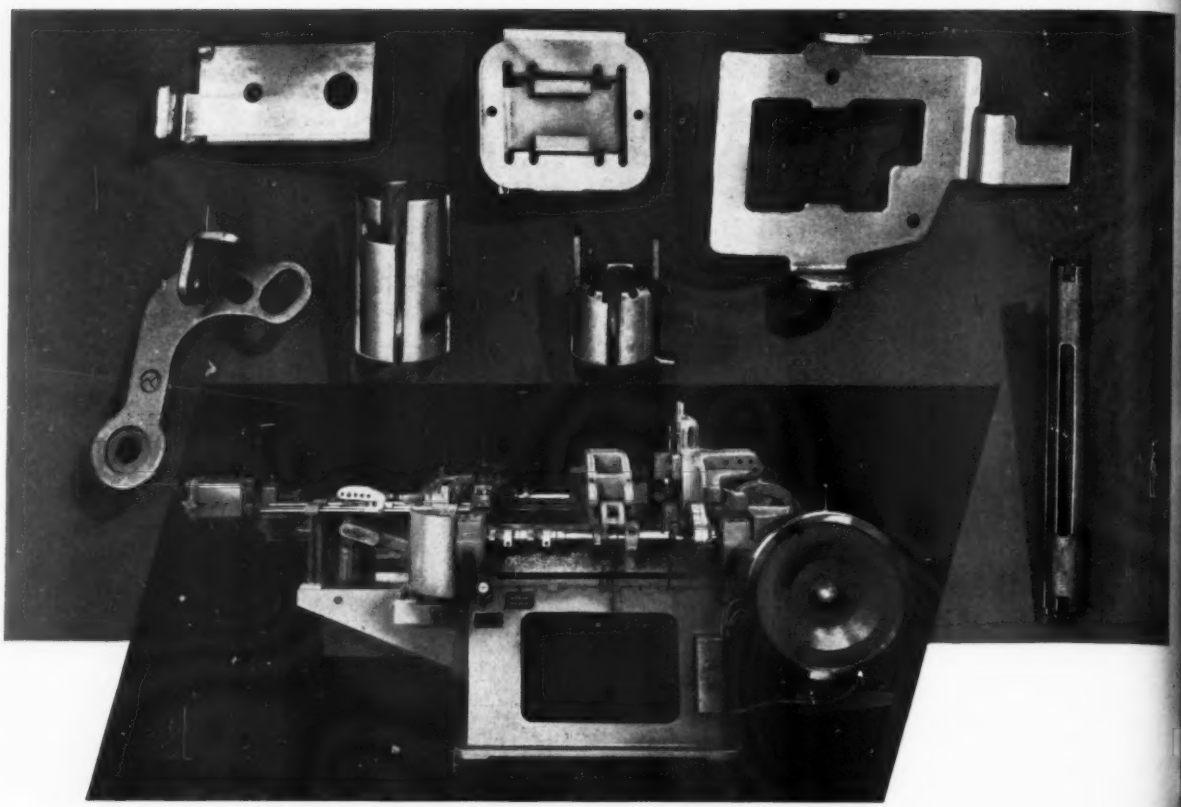
Only J&L chasers carry a *written* Guarantee of Class III or better — not sometimes, but *everytime.*

JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 519 Clinton St., Dept. 710, Springfield, Vt., U.S.A. J&L . THREAD TOOL DIV.

CIRCLE INFORM-A-GRAM KEY NO. 21



FOR *AUTOMATIC* PRODUCTION OF *PRECISION* STAMPINGS THE U. S. MULTI-SLIDE®

In the production of precision stampings, every secondary operation, every inspection, every handling helps to send your costs UP! You can keep these costs at a minimum by using U. S. Multi-Slide Machines to produce parts rapidly, accurately, and *complete* in a single operation. The illustration above shows some typical parts which have been produced in this manner in U. S. Multi-Slides. These parts—of copper, aluminum, brass and steel—illustrate the variety of operations, including piercing, trimming, swaging, coining, blanking and forming, which can be performed in any combination in a U. S. Multi-Slide. Many of these parts formerly required costly secondary operations and intermediate inspections. Now they are produced uniformly and to close tolerances in a single, high-speed operation.

U. S. Multi-Slide Machines are built in four sizes. Illustrated above is the No. 33 Machine, with capacity for material up to 2½" wide and feed length adjustable up to 12½". If your program involves the production of precision stampings, investigate the labor-saving, time-saving features of U. S. Multi-Slides.

Ask for a copy of Bulletin 15-P containing complete specifications.

U.S. TOOL COMPANY, Inc.

AMPERE (East Orange) NEW JERSEY

Builders of U. S. Multi-Slides — U. S. Multi-Millers

U. S. Automatic Press Room Equipment — U. S. Die Sets and Accessories

CIRCLE INFORM-A-GRAM KEY NO. 22

Miller - AIR CYLINDERS

In Thousands of Different Selections For Immediate Delivery!

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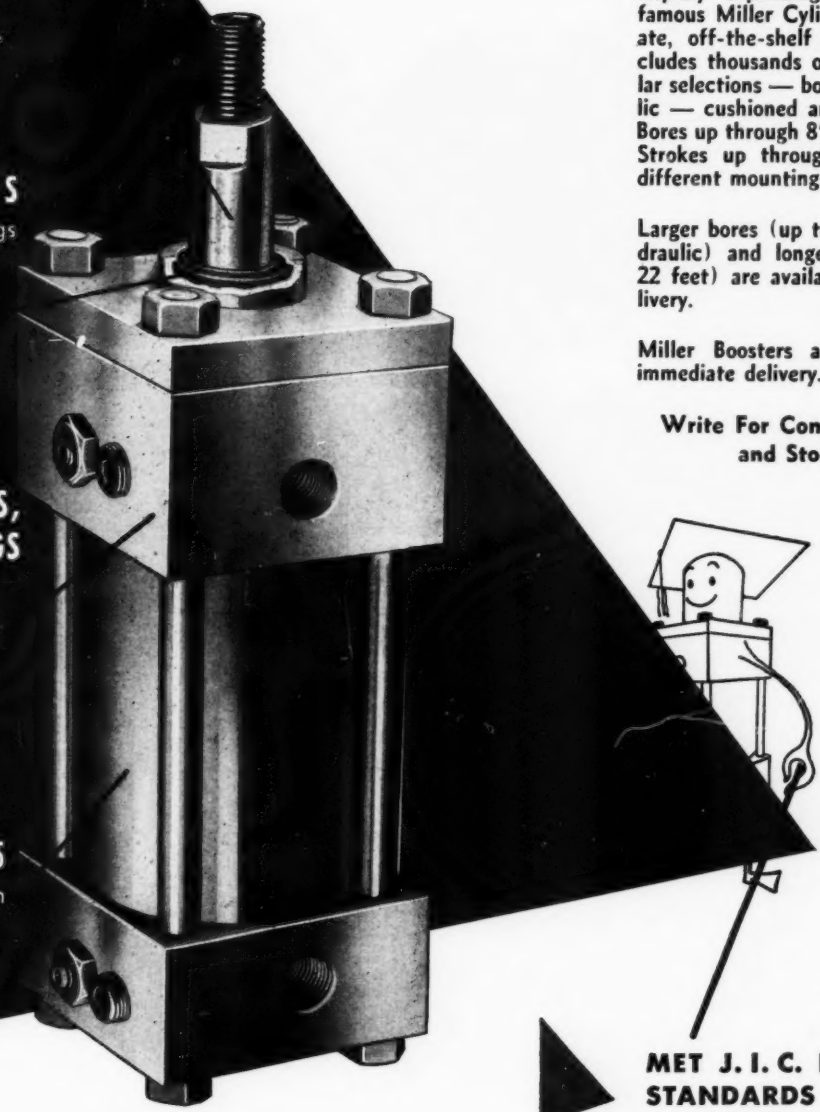
HROME PLATED
ISTON RODS
event Scratch-Damage,
cks and Rust

IRT WIPER SEALS
otect Rods, Seals, Bushings

OLID STEEL HEADS,
APS and MOUNTINGS
minate Breakage

RASS BARRELS
minate Rust and Corrosion



Rapidly expanding list of quality-famous Miller Cylinders for immediate, off-the-shelf delivery now includes thousands of different, popular selections — both air and hydraulic — cushioned and non-cushioned. Bores up through 8" air, 5" hydraulic. Strokes up through 36". Over 30 different mountings.

Larger bores (up to 20" air, 12" hydraulic) and longer strokes (up to 22 feet) are available on longer delivery.

Miller Boosters also in stock for immediate delivery.

Write For Complete Catalog and Stock List

WRITE FOR CYLINDER BULLETINS A-105 and H-104

Complete Miller cylinder line includes: air cylinders, 1½" to 20" bores, 200 PSI operation; low pressure hydraulic cylinders, 1½" to 6" bores for 500 PSI operation, 8" to 14" bores for 250 PSI; high pressure hydraulic cylinders, 1½" to 12" bores, 2000-3000 PSI operation. All mounting styles available.

MET J. I. C. PNEUMATIC STANDARDS years before their adoption in 1950.

SPACE-SAVING SQUARE DESIGN originated by Miller in 1945.

SALES AND SERVICE FROM COAST TO COAST

EVELAND • YOUNGSTOWN • DAYTON • PITTSBURGH • PHILADELPHIA • STON • HARTFORD • NEW YORK CITY • BUFFALO • ST. PAUL • GRAND PIDS • DETROIT • FLINT • FORT WAYNE • SOUTH BEND • INDIANAPOLIS MILWAUKEE • LOUISVILLE • KANSAS CITY • SEATTLE • LOS ANGELES • N FRANCISCO • BALTIMORE • DENVER • ST. LOUIS • MOLINE • CHICAGO HOUSTON • TORONTO, CANADA and OTHER AREAS

MILLER FLUID POWER CO.
(Formerly MILLER MOTOR COMPANY)

2046 N. Hawthorne Ave., Melrose Park, Ill.

AIR & HYDRAULIC CYLINDERS • BOOSTERS • ACCUMULATORS

P-K means OK

TRADE MARK. REG. U.S. PAT. OFF.

in the package

in assembly

in product performance

P-K means OK right down the line. *When you buy* P-K Socket Screws, it means OK for guaranteed quality and tolerance gaged to highest standards. *On the job,* it means OK for advanced design features that speed the job, prevent errors, like SIZE-MARK on P-K Cap Screws. *When you sell* your product, it means OK for lasting strength, dependable performance proved in millions of assemblies.

Get samples, information from your P-K Distributor, or write Parker-Kalon Division, General American Transportation, Corporation, 200 Varick St., New York 14.

make planned assembly savings pay off

PARKER-KALON SOCKET SCREWS

IN STOCK—see your nearby P-K Socket Screw Distributor

CIRCLE INFORM-A-GRAM KEY NO. 24

EASIEST OF ALL SHEARS TO OPERATE

"EASIEST of all Shears to operate" are not just our words. They are words of operators being heard with increasing frequency as more Steelweld Shears are placed in plants throughout the country.

Men who have worked for many years on shears of various makes and know them through and through are acclaiming the many features incorporated into Steelwelds — features that ease their work, speed production and make for greater accuracy and minimum maintenance.

Steelweld Shears are entirely new machines designed from scratch as such. They are not a variation of or an adaptation to any previously existing machine. The designers of these new shears were free to incorporate all ideas and features that would result in better machines. They were not hampered by tradition or previous designs or models.

As a result Steelweld Shears are radically different with advantages never before possible.

Whether or not you are in need of a shear at this time, if you work plate in any thickness up to 1¼-inch or length to 18 feet, we urge you to get more data on these modern machines. Keep informed — send for the catalog below.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.

8705 E. 282 STREET, WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

CIRCLE INFORM-A-GRAM KEY NO. 25

MOORE SPECIAL TOOL COMPANY

Holes, Contours, Surfaces

Published in the interests of greater accuracy and quality in the toolroom and on the production line by the Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn., builders of Jig Borers, Jig Grinders, Panto-Crush Wheel Dressers, Precision Rotary Tables, Motorized Centers and a complete line of Hole Location Accessories.

7 Tricks of the Trade in Jig Grinding Small Holes

The following tricks of the trade will prove helpful in jig grinding small holes with a diamond-charged mandrel:

1. Uniformly graded diamond powder should be used for charging mandrels. Holes from minimum (1/64") to about 3/32" in diameter should be roughed and finished with 80-100 grit powder. Larger holes may be roughed somewhat more rapidly with a coarser grade, 60-80 grit.

2. Avoid bellmouth by preventing the mandrel from leaving the hole at either end.

3. Since a freshly charged mandrel will cut much more rapidly than a worn one, avoid introducing a freshly charged tool as a hole nears size, Fig. 1.

4. Do not permit the uncharged *shank* of a mandrel to contact the surface being ground. Frictional heat will burn both the work and the mandrel. The former, partially annealed at point of such contact, will charge with diamond sut and probably be ruined.

5. It is generally more economical and efficient to consider mandrels as expendable and make a new one for each job. Since the cost is only a few cents, use of an old one, or even the time spent trying to match one to requirements, is hardly justified.

6. Because mandrels cannot be trued with a diamond, it is necessary to measure both the top and bottom of a hole while grinding, in order to avoid a ridge.

7. In view of point 6, it is advisable to set the work up on parallels of sufficient height to enable measurement from beneath the workpiece, Fig. 2.

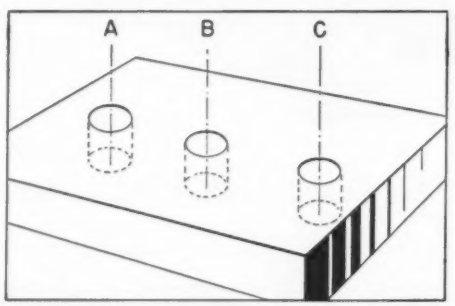


Fig. 1. In grinding three holes to size, A and B are roughed to within .001"—.002", and C within about .005". Using a freshly charged mandrel, C is finished to size, thereby breaking down the high points on the tool. A and B may now be safely ground to size.

Fig. 2. Workpiece is mounted high enough to permit measuring bottom as well as top of hole.

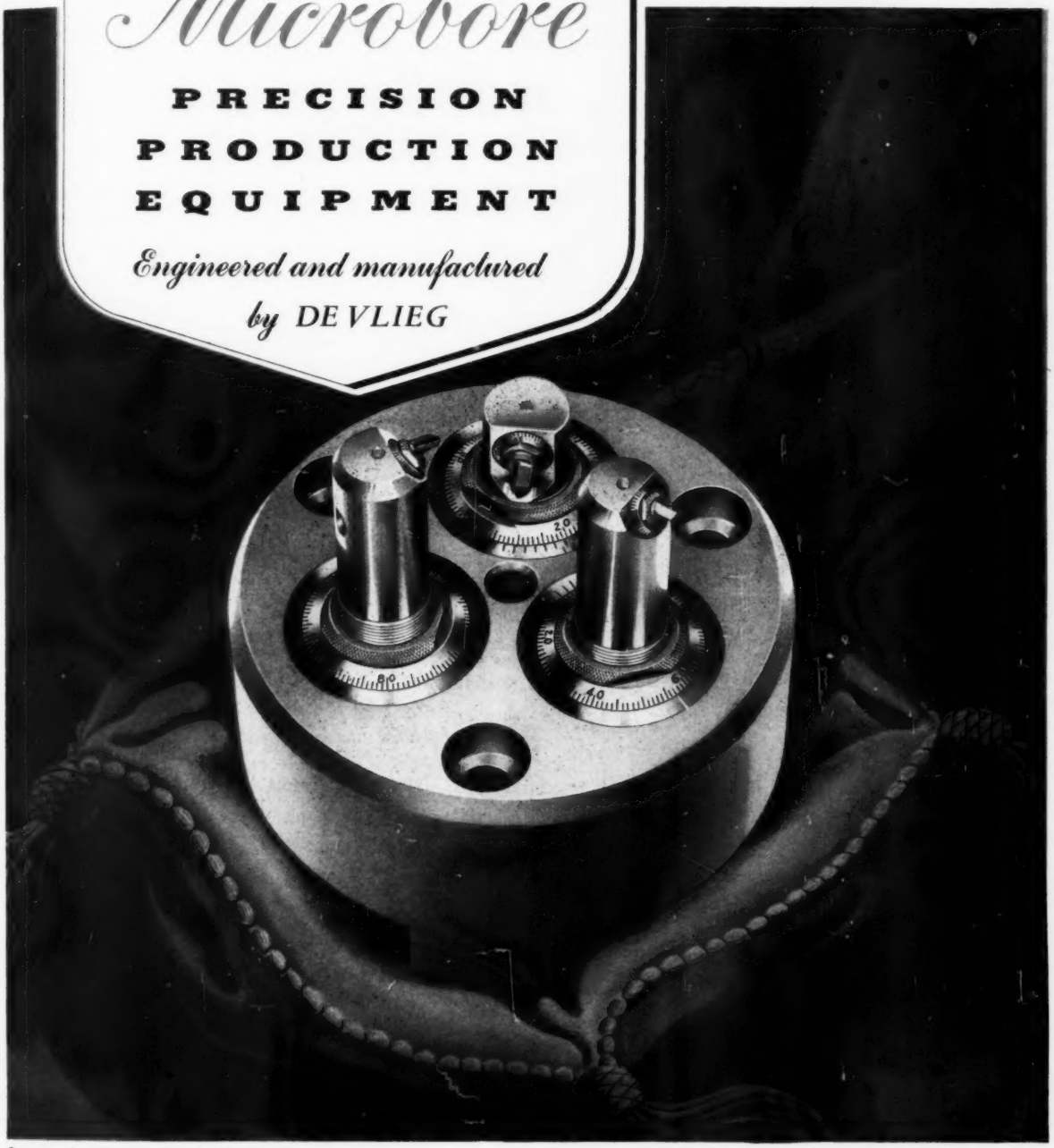
Get ALL the answers from this new, 424-page book

The information on this page is just a sample of the valuable, on-the-job aid you can get from Moore's *all-new* book, HOLES, CONTOURS AND SURFACES. Tells you how to produce tools, dies and precision parts *the modern way*. 124 pages, 495 illustrations. 184 pages of Woodworth Coordinate Location Tables from 3 to 100 holes. Price only $5 in U.S.A., $6 elsewhere. Send check or money order to Moore Special Tool Co., Inc., 726 Union Ave., Bridgeport 7, Conn.

Microbore

PRECISION PRODUCTION EQUIPMENT

Engineered and manufactured by DEVLIEG



Courtesy of the Emerson Electric Mfg. Co., St. Louis, Mo.

Illustration shows Microbore cluster tool furnished to Emerson Electric Co., for finish turning O.D.—finish boring I.D. and facing operations at one pass. Standard Microbore units are arranged to provide micrometer vernier adjustment for both radial and linear settings of the cutting tools.

Send for new illustrated catalog.

Discuss your tooling problems with our Microbore specialists

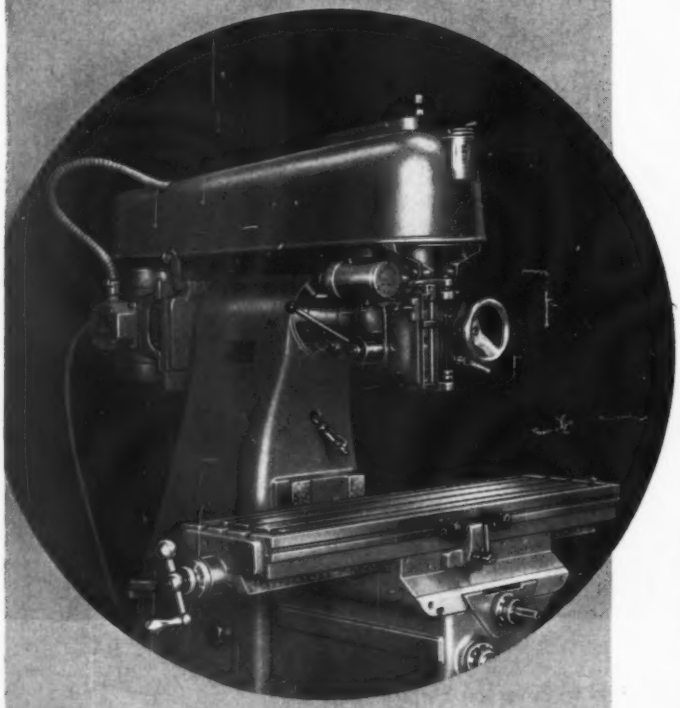
DEVLIEG MICROBORE COMPANY 2720 West Fourteen Mile Road • Royal Oak, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 27

does MORE work... MORE easily

new POWER FEED HEAD

U. S. Vertical Miller



Write for descriptive folder

Here's the new U. S. Vertical Miller with Power Feed Head – the head into which U. S. has built all the most wanted features without sacrificing traditional U. S. simplicity. Check its infinitely variable feed rate, its 800 pounds of down thrust on the quill, its supplemental hand feeds – it is the milling head that was designed to meet all shop needs.

Add to these the basic advantages of the U. S. Vertical Miller. You can easily see why it's the milling machine that "does more work more easily."

Detailed literature on request.
The U. S. Burke Machine Tool Division.
7 Brotherton Road, Cincinnati 27, Ohio.

more versatile
Feed infinitely variable from .002" to .008" while in operation

greater capacity
5½" power quill travel; 800 lb. down thrust

more convenient
Supplemental hand feeds

increased rigidity
Enclosed hard chrome plated quill with internal lock

THE U·S·Burke MACHINE TOOL DIVISION

CIRCLE INFORM-A-GRAM KEY NO. 28

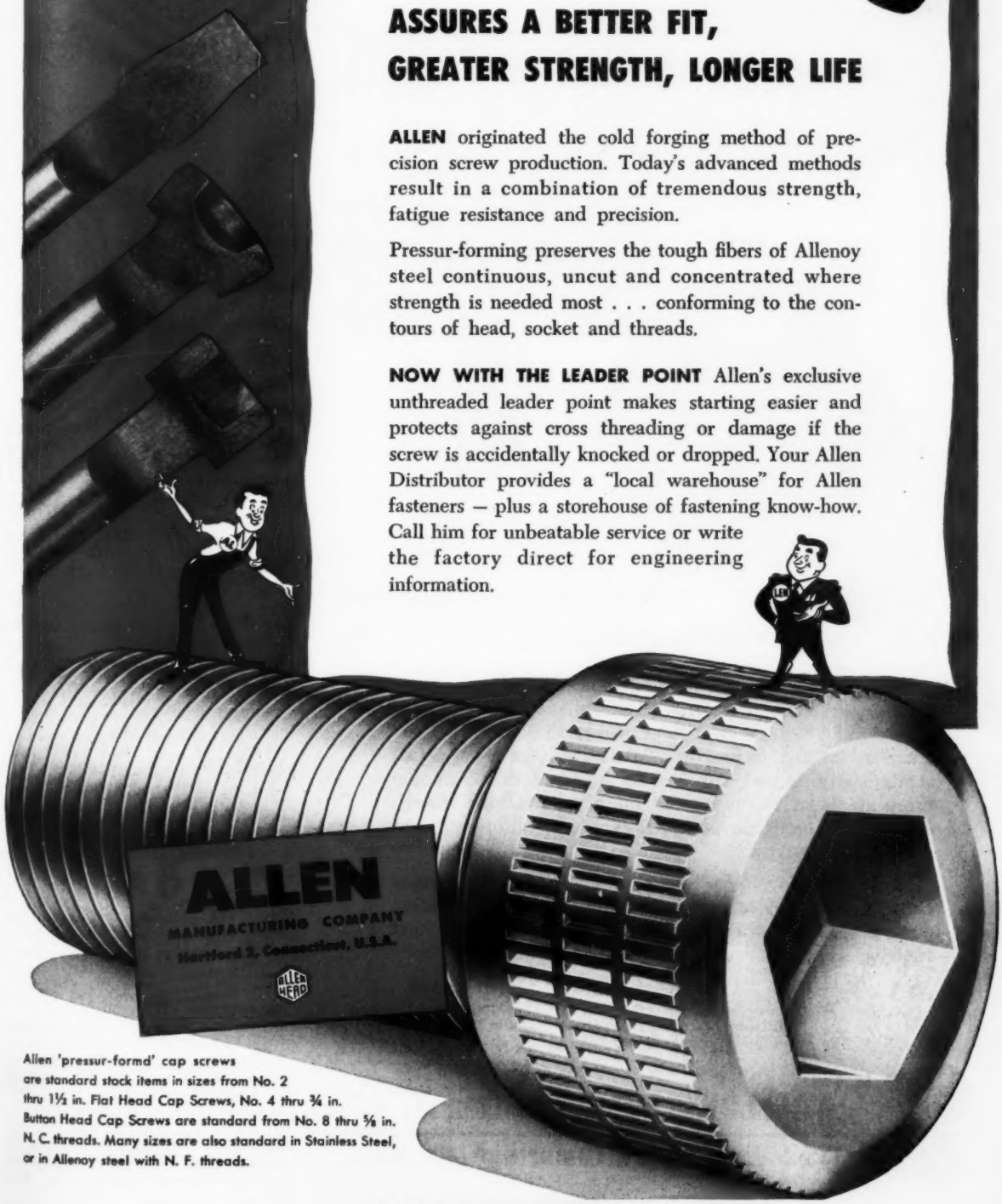
Pressur-Forming

ASSURES A BETTER FIT, GREATER STRENGTH, LONGER LIFE

ALLEN originated the cold forging method of precision screw production. Today's advanced methods result in a combination of tremendous strength, fatigue resistance and precision.

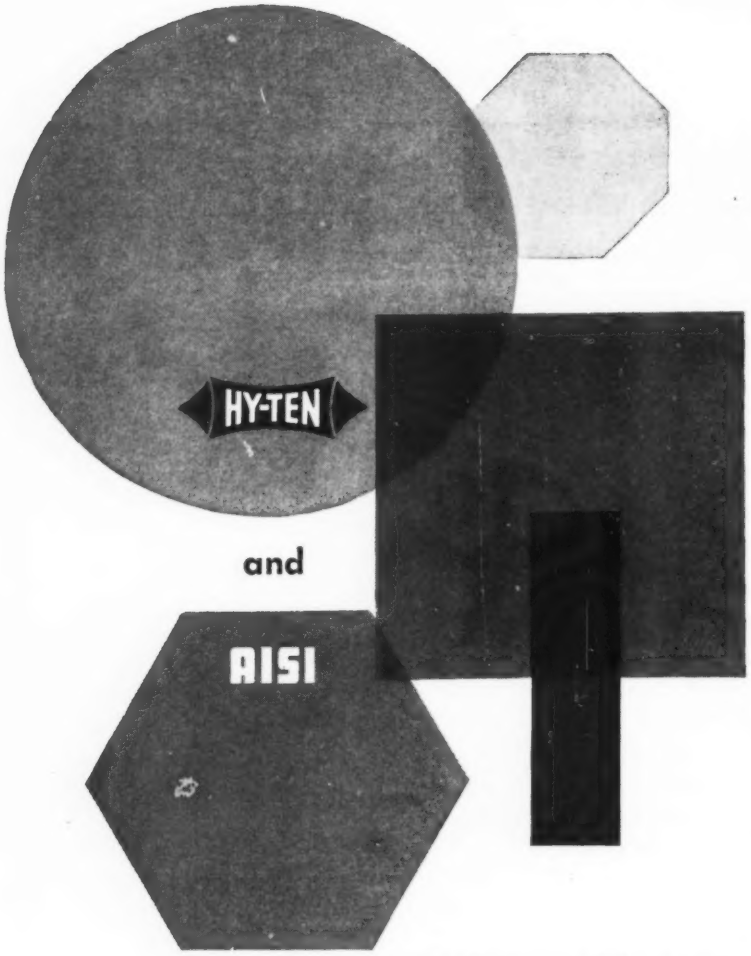
Pressur-forming preserves the tough fibers of Allenoy steel continuous, uncut and concentrated where strength is needed most . . . conforming to the contours of head, socket and threads.

NOW WITH THE LEADER POINT Allen's exclusive unthreaded leader point makes starting easier and protects against cross threading or damage if the screw is accidentally knocked or dropped. Your Allen Distributor provides a "local warehouse" for Allen fasteners — plus a storehouse of fastening know-how. Call him for unbeatable service or write the factory direct for engineering information.



Allen 'pressur-formd' cap screws are standard stock items in sizes from No. 2 thru 1½ in. Flat Head Cap Screws, No. 4 thru ¾ in. Button Head Cap Screws are standard from No. 8 thru ⅝ in. N. C. threads. Many sizes are also standard in Stainless Steel, or in Allenoy steel with N. F. threads.

CIRCLE INFORM-A-GRAM KEY NO. 29



bars, billets and forgings in sizes, shapes and treatments for every need!

Wheelock, Lovejoy & Company, Inc., can fill your alloy steel requirements promptly. This applies to both standard AISI and SAE steels and to our own HY-TEN steels—"the standard steels of tomorrow". Take advantage of our seven strategically located warehouses. All of them can supply these steels in the form and quantity you need. Every warehouse, too, is staffed with expert metallurgists who are ready to serve you.

Write today for your FREE copies of Wheelock, Lovejoy Data Sheets. They contain complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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135 Sidney Street, Cambridge 39, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 30

Will You Be There?

Apr. 4-6. National Fluid Power Association. 2nd Annual Spring Meeting. Broadmoor Hotel, Colorado Springs, Colo.

•

Apr. 12-13. Michigan State College. Centennial Symposium. Business in the Future. East Lansing, Mich.

•

Apr. 13-15. American Society of Lubrication Engineers. 10th Annual Meeting and Lubrication Exhibit. Hotel Sherman, Chicago.

•

Apr. 18-20. American Society of Mechanical Engineers. Spring Meeting. Baltimore, Md.

•

Apr. 18-21. Society of Automotive Engineers. Golden Anniversary Aeronautic Meeting, Production Forum, Aircraft Engineering Display. Hotels Statler and McAlpin, New York.

•

Apr. 18-21. American Management Association. 24th National Packaging Exposition. International Amphitheatre. Chicago.

•

Apr. 19-20. Westinghouse 19th Annual Machine Tool Electrification Forum. Statler Hotel, Buffalo, N. Y.

•

May 4-7. National Screw Machine Products Association. Annual Convention. Statler Hotel, Buffalo, N. Y.

•

May 7-15 Society of the Plastics Industry. Annual Meeting and Conference. Cruise, "Queen of Bermuda".

•

May 8-10. National Tool & Die Manufacturers Association. Spring Board Meeting. Statler Hotel, Washington, D. C.

•

May 12-14. Michigan State College. Centennial Symposium. Automation-Engineering for Tomorrow. East Lansing, Mich.

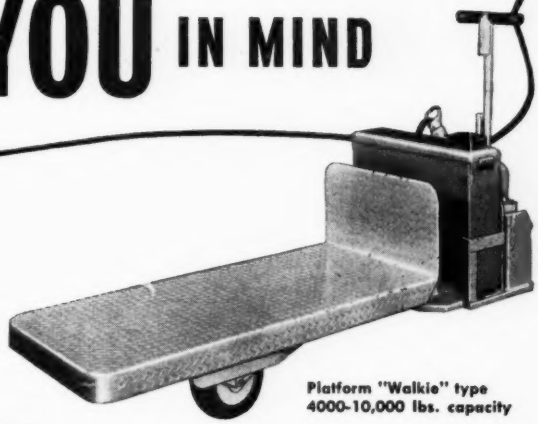
•

May 16-20. American Material Handling Society. 6th National Materials Handling Exposition and Conference. International Amphitheatre, Chicago.

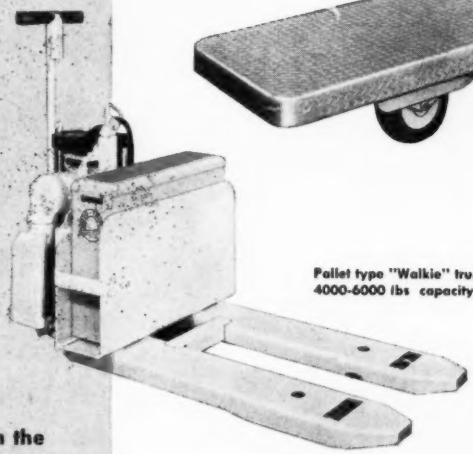
•

May 23-25. American Society for Quality Control. 9th Annual Convention. Hotels Statler and New Yorker, New York.

DESIGNED & MANUFACTURED WITH YOU IN MIND



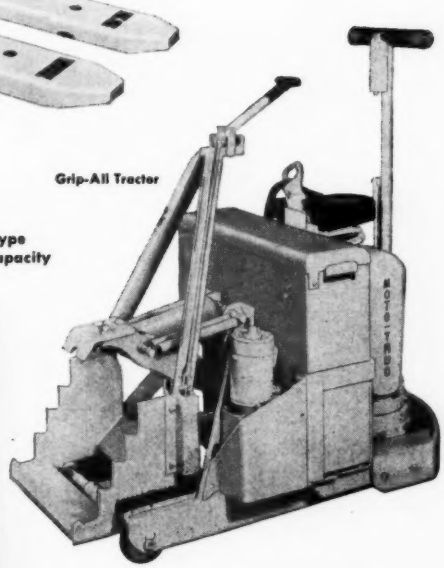
Platform "Walkie" type
4000-10,000 lbs. capacity



Pallet type "Walkie" truck
4000-6000 lbs capacity

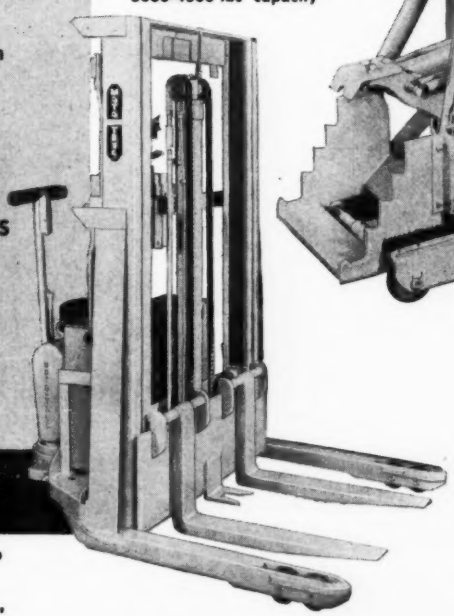
Here's Why...

- **Maximum Maneuverability** . . . some models only 23¾" longer than the load . . . space efficiency plus!
- **Stability** . . . low center of gravity offers maximum stability.
- **Ease of Operation** . . . Patented Roller Grip Controls offer "Simplified Operation".
- **Ease of Maintenance** . . . MOTO-TRUC design offers the finest in quick . . . easy maintenance.
- **Safety** . . . Deadman controls cut off the power and apply the brakes . . . automatically.



Grip-All Tractor

Hi-Lift "Walkie" type
3000-4000 lbs capacity



REPRESENTATIVES IN PRINCIPAL CITIES

MOTO-TRUC
Designers FOR THE INDUSTRY
PATENTED

The MOTO-TRUC Co

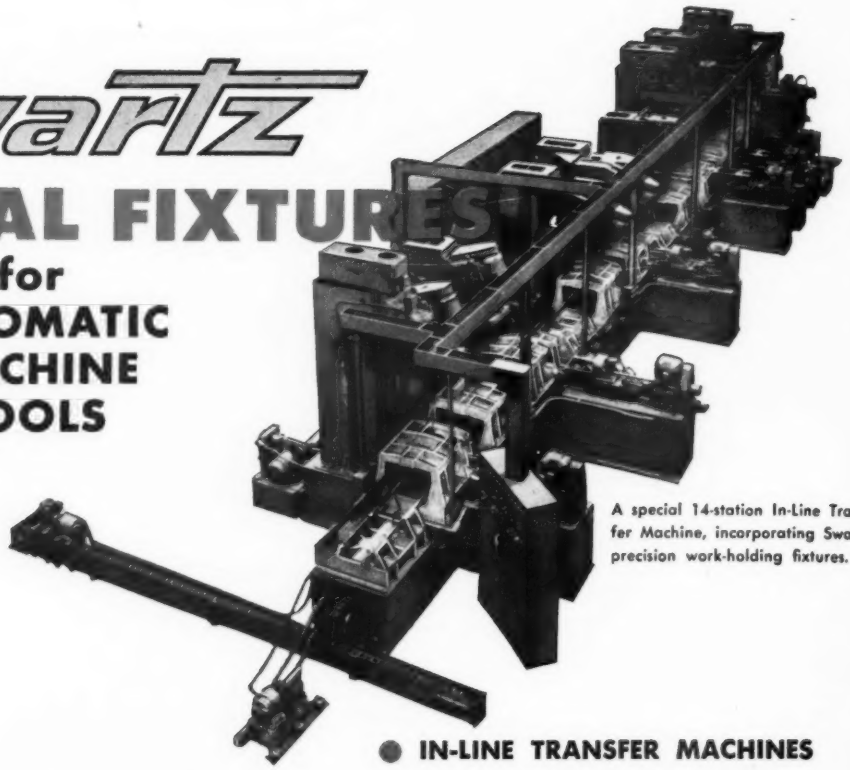
1990 E. 59th St. • Cleveland 3, Ohio
Pallet . . . Platform . . . Hi-Lift Trucks
LARGEST EXCLUSIVE MANUFACTURER OF "WALKIES"

Send for
Bulletin No. 54

CIRCLE INFORM-A-GRAM KEY NO. 31

Swartz

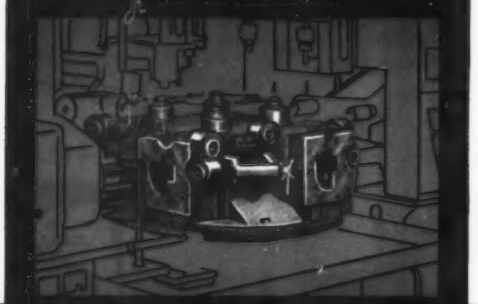
SPECIAL FIXTURES for AUTOMATIC MACHINE TOOLS



A special 14-station In-Line Transfer Machine, incorporating Swartz precision work-holding fixtures.

- IN-LINE TRANSFER MACHINES
- ROTARY INDEX MACHINES
- TRUNNION INDEX MACHINES
- SINGLE-STATION MULTIPLE-OPERATION MACHINES

Station No. 1—Special 14-station In-Line Transfer Machine. Swartz fixtures were specified for dependable, on-the-job fixture performance.



Here is a 4-station Rotary Index Machine, equipped with Swartz fixtures. Swartz fixtures were specified for maximum service and dependability.

There are many advantages in specifying Swartz precision work-holding fixtures . . . advantages which are shared alike by both buyer and builder of automatic machine tools.

Of particular importance, is the seasoned experience, and specialized know-how which Swartz has gained through more than 30 years of fixture-building service to the machine tool industry. This experience and skill, together with the modern facilities needed to do the job, make Swartz service *complete* . . . from part print to finished fixture!

There are other advantages, too, in specifying and using Swartz fixtures. It will pay you to get the facts! A Swartz engineer will be glad to discuss your fixture requirements, and point out the many ways Swartz service can work for you *profitably*.

Write Today **Swartz service is outlined in this interesting new brochure, "Advancing Automation." A copy will be mailed on request.**

SWARTZ TOOL PRODUCTS
Division of Jefferson Corporation
13336 FOLEY AVENUE • DETROIT 27, MICHIGAN

Designers and Builders of: Pump Jigs • Standard Fixtures • Fixture Locks • Special Fixtures for Automatic Machine Tools.

CIRCLE INFORM-A-GRAM KEY NO. 32

you can sharpen

4,800

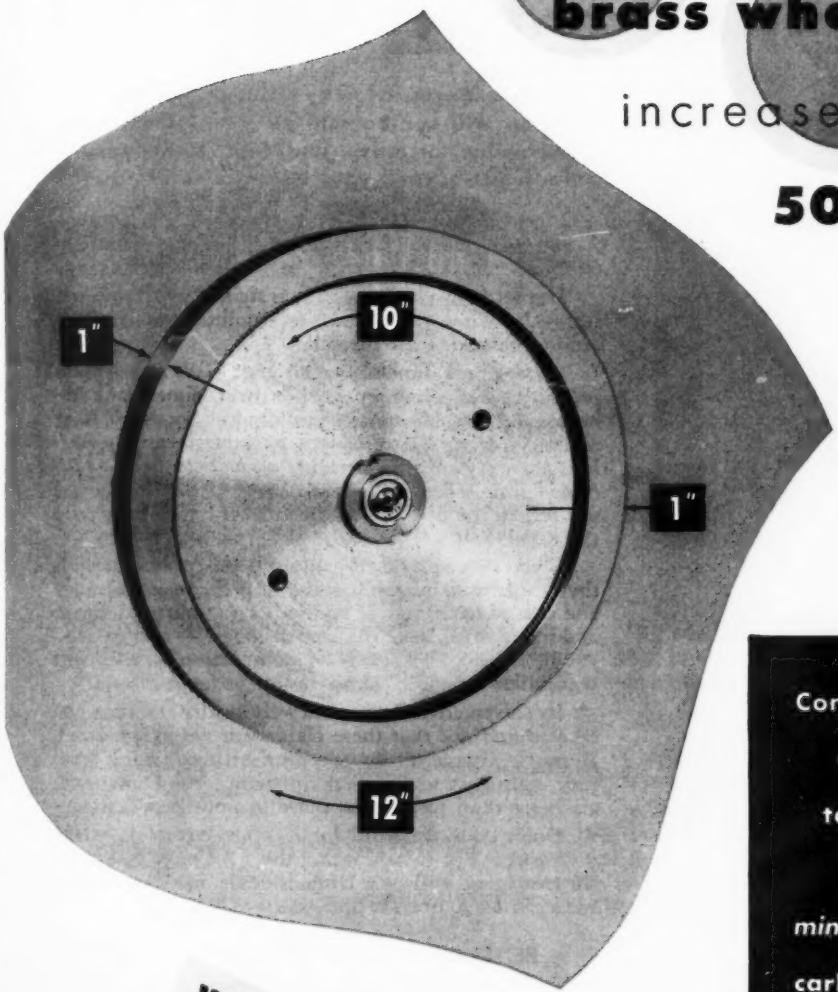
$\frac{1}{2}$ x $\frac{1}{2}$ tungsten carbide

insert tools with this $45

brass wheel and

increase tool life

50 to 200%



Ave. cost per tool sharpened:

.009¢

Convert from abrasive and diamond wheels to an Elox brass wheel and save 50 *minutes* sharpening 20 carbide insert tools.

WE CAN SHOW YOU HOW!

elox *corporation of michigan*

7 **north rochester road • clawson, michigan**

CIRCLE-INFORM-A-GRAM KEY NO. 33

NOT JUST BETTER-

but

Much Better!

Test the Dimensionair by the most rigid methods and you will see beyond all doubt that it has unparalleled accuracy and that it has many advantages beyond your expectations.

Put it in your plant — alongside any other air gage — and still more advantages will become definitely obvious.

Just setting it ready to gage is strikingly simple and fast — *less than ten seconds* — absolutely no fiddling around balancing air pressures.

It is the only dimensional air gage *made to a definite predetermined accuracy.* All critical dimensions are made precisely to specified tolerances to assure that accuracy. Every gage repeats the same measurements. It is the *only air gage accurate enough to have a calibrated scale when set to one master.* Its calibration is *not* left to the operator's adjustments but is built into the gage.

If you use old style air gages and are unfamiliar with the Dimensionair, you'll really appreciate its accuracy and ease of handling. If you will give yourself a break and really investigate the Dimensionair — and try it — you'll say, too, "There's no comparison". You will really like it.

Its eleven advantages positively justify the time you take to find out that these claims are *not* exaggerated. In quick, simple set up, speed of setting, gaging accuracy, stability and simple maintenance, the Dimensionair more than justifies its place in your production.

Don't take our word for it — *or anybody's* — take your own. Try it, buy it and use it. You'll insist that the next gage will be a Dimensionair, too. Just ask us for a chance to operate one.

FEDERAL PRODUCTS CORPORATION
5234 Eddy Street, Providence 1, R. I.

Ask **FEDERAL**

FOR ANYTHING IN MODERN GAGES...

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automatically Controlling Dimensions on Machines

CIRCLE INFORM-A-GRAM KEY NO. 34

Now save money with BENCO MASTER COLLETS

MASTER COLLET $47.60 NET

COLLET PADS $17.60 NET

SOLID COLLET $37.80 NET

"C. B." Acme type and Martin Master Collets made by Benco save hours and dollars on each set-up, because the pads are changed in minutes without removing the collets from the spindle. With Benco Master Collets and various size sets of pads you can handle any size stock to the full capacity of your machines.

Benco Master Collets more than pay for themselves through improved production, fewer rejects, reduced down-time. "Cam-grinding" on the taper assures maximum ease of operation in the chuck head. Accurate machining and careful inspection provide long life and continuous, trouble-free performance.

Pads are much cheaper than collets! See illustration for examples of saving in cost. On every job, large or small, you'll appreciate the advantages of Benco Master Collets and Pads. A large assortment of standard types and sizes are ready for immediate shipment. Get your supply now!

The BENCO line includes:

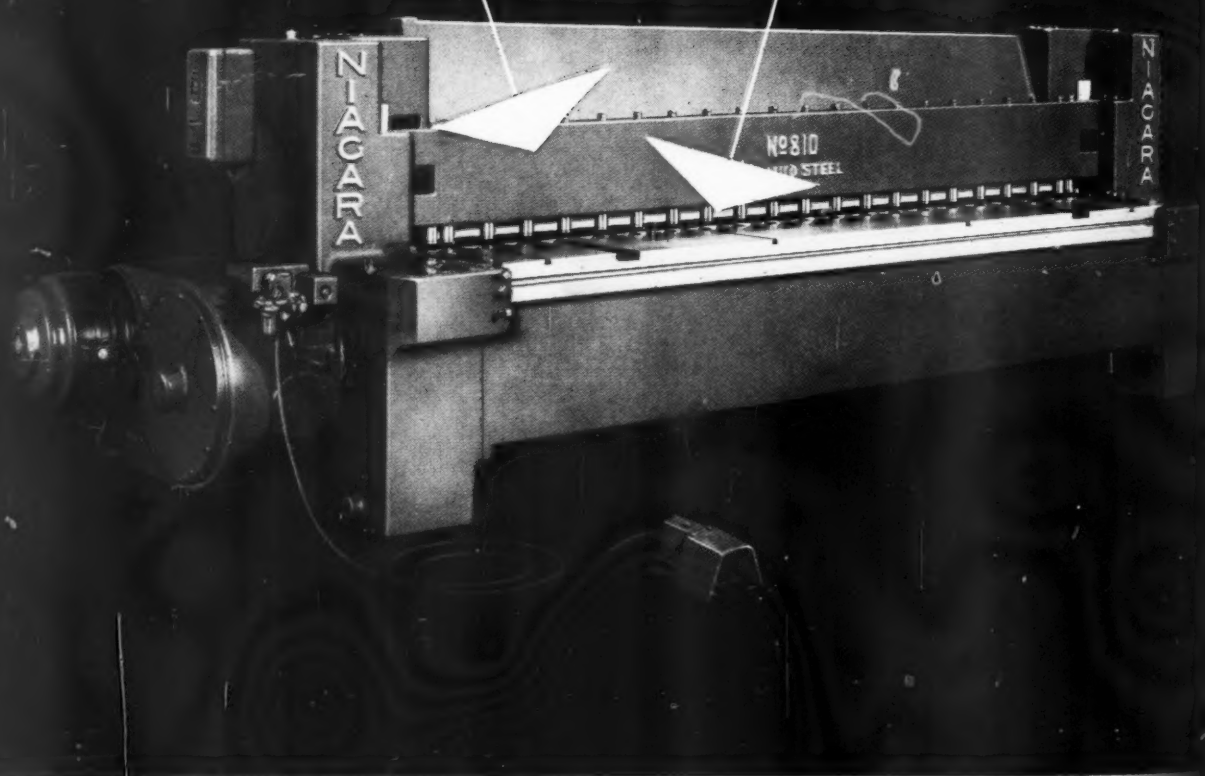
- Master Pushers and Pads
- Master Collets and Pads
- Pushers and Feed Fingers
- Ejector Collets
- Carbide-faced Stock Stops for B. & S. Machines
- Collet Sleeves and Chuck Nuts for B. & S. Machines

Benco collet manufacturing co.
cleveland 14, ohio

REPRESENTATIVES: Tornquist Machinery Company, Los Angeles, Calif.; Dorow Machine Tools, Wichita, Kan.; Harry Dunn Corp., Houston, Texas; J. K. Bousum Co., Detroit, Mich.; Walter J. Greenleaf Co., Pittsburgh and Erie, Pa.; Hospelhorn Tool & Supply Co., Dayton, Ohio; Kel-Sir Company, Milwaukee, Wisc.; Mason & Luttrell Sales Eng., Okemos, Mich.; Fred J. McMillen, Providence, R. I.; Pearse-Dengel Tool Company, Hasbrouck Heights, N. J.; Philadelphia Tool Company, Bala-Cynwyd, Pa.; Erwin A. Slate, Gasport, N.Y.; W. C. Straub, Cleveland, Ohio; G. W. Wittlinger, Chicago, Ill.; J. E. Dilworth Company, Memphis, Tenn.; H. M. Scherling, Minneapolis, Minn.; Die Makers Supply Co., Kansas City, Mo.; H. F. Soderling Co., Seattle, Wash.; Production Tools, Toronto, Canada.

CIRCLE INFORM-A-GRAM KEY NO. 35

SELF-COMPENSATING HOLDDOWN



America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal W

a BIG FACTOR in the superiority of Niagara Shears

"STRAIGHT-EDGE" CUTTING ACCURACY
Positive, power actuation grips work securely for maximum cutting accuracy.

LOW IMPACT AVERTS DAMAGE AND INACCURACY
Individual pressure feet contact work with low impact, thus safeguarding both the material and bed against damage, as well as reducing noise level. No hammer-blows to mar work. No peening of bed with resulting distortion of knife seat.

SIMPLIFIED, LOW UPKEEP DESIGN
Simplicity of design and construction, involving a minimum number of parts, assures negligible servicing. With *less* to go wrong, there is *less* to repair and replace.

HOLDS WORK FLAT AND STATIONARY
Multiple pressure feet on 6" centers, applying uniform pressure, hold work flat and tight against bed to assure utmost shearing accuracy. No rippling of sheet between feet as cut progresses. Firm grip on short pieces.

HANDLES STOCK OF VARYING THICKNESS
Individual feet are self-compensating, requiring no adjustment for cutting stock of different thicknesses . . . *even at the same time.*

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N.Y.
DISTRICT OFFICES: Detroit • Cleveland • New York • Philadelphia
Dealers in principal U. S. cities and major foreign countries

In a power squaring shear, no *single* feature nor component can be fully responsible for accuracy, speed and economy. *They* result from a *combination* of features such as the self-compensating holddown; rigid, fully closed box section construction of bed and crosshead; low slope of upper knife; ample and accurately held crosshead guides; multiple point sleeve clutch —the very features that have established the marked superiority of Niagara's Underdrive Series.

For the whole story, straightforwardly presented, on America's most complete line of underdrive power squaring shears, with capacities from shim stock to 1 in. thick mild steel (lengths 3 to 20 ft.), request *Niagara Bulletin 69*. Write today.

NIAGARA

UNDERDRIVE SQUARING SHEARS

Presenting... the NEW

adaptable to almost all horizontal and some vertical milling machines ...regardless of make

The new TRI-D Milling Head is the latest addition to Kearney & Trecker's outstanding Rotary Head milling family. TRI-D is designed for quick, easy mounting on practically all horizontal and some vertical milling machines.

The TRI-D Milling Head can produce almost any geometric shape in metal employing straight lines, radii or angles — all in a single set-up. Power is transmitted to the spindle through a heavy-duty flexible shaft driven by the machine spindle or a separate variable speed motor unit.

TRI-D's matchless technical perfection brings to metal cutting an insured investment equalled by no other single element of production. Find out how you can increase production and cut milling costs with this new milling head. Your Kearney & Trecker representative will be pleased to give you all the details. Contact him today, or write Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

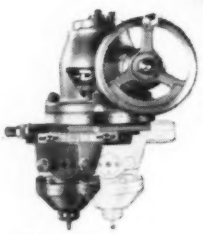
BOOTH NO. 508

Pat. No. 2286821 other Pat. Pend.

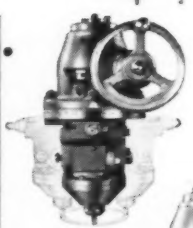
Kearney & Trecker CORPORATION
MILWAUKEE 14, WISCONSIN

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

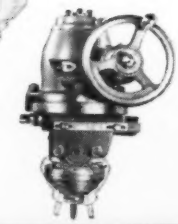
Only tri-D has all 3 . . .



1. LATERAL ADJUSTMENT of the cross-slide permits off-setting the spindle up to 2½". A large dial, graduated in thousandths, is mounted on the cross-slide screw. Precision-ground screw assures the ultimate in accuracy and long life. A friction lock secures cross-slide position.



2. ROTARY MOVEMENT of the head through a complete circle, or any specific part, is easily accomplished by turning handwheel in either direction. Combined with lateral adjustment of the cross-slide, this rotary movement permits milling of circles up to 5" in diameter.



3. ANGULAR ADJUSTMENT of cutter, an exclusive feature, is the swivel block which permits positioning of the cutter at any angle in the vertical plane, up to 15°, either side of center. Easy-to-read graduations make setting to a precise angle a very simple operation.

Kearney & Trecker Corporation
6784 W. National Avenue
Milwaukee 14, Wisconsin

Please send me catalog No. TD-10 with details on new TRI-D Milling Head.

Name.....

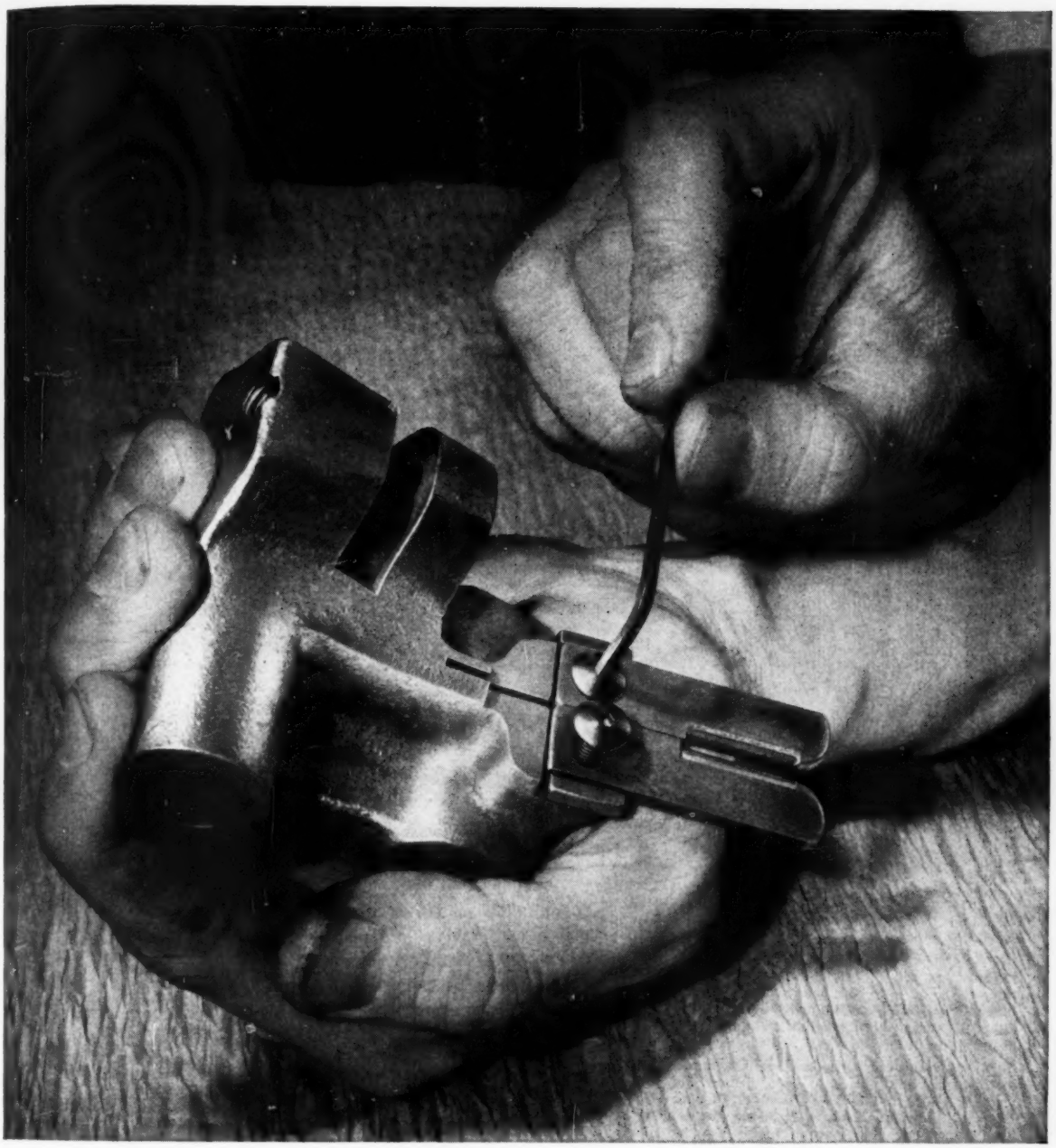
Title.....

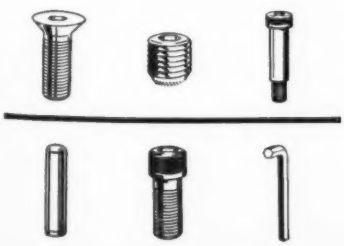
Company.....

Address.....

City.....Zone.....State.....

UNBRAKO AT WORK

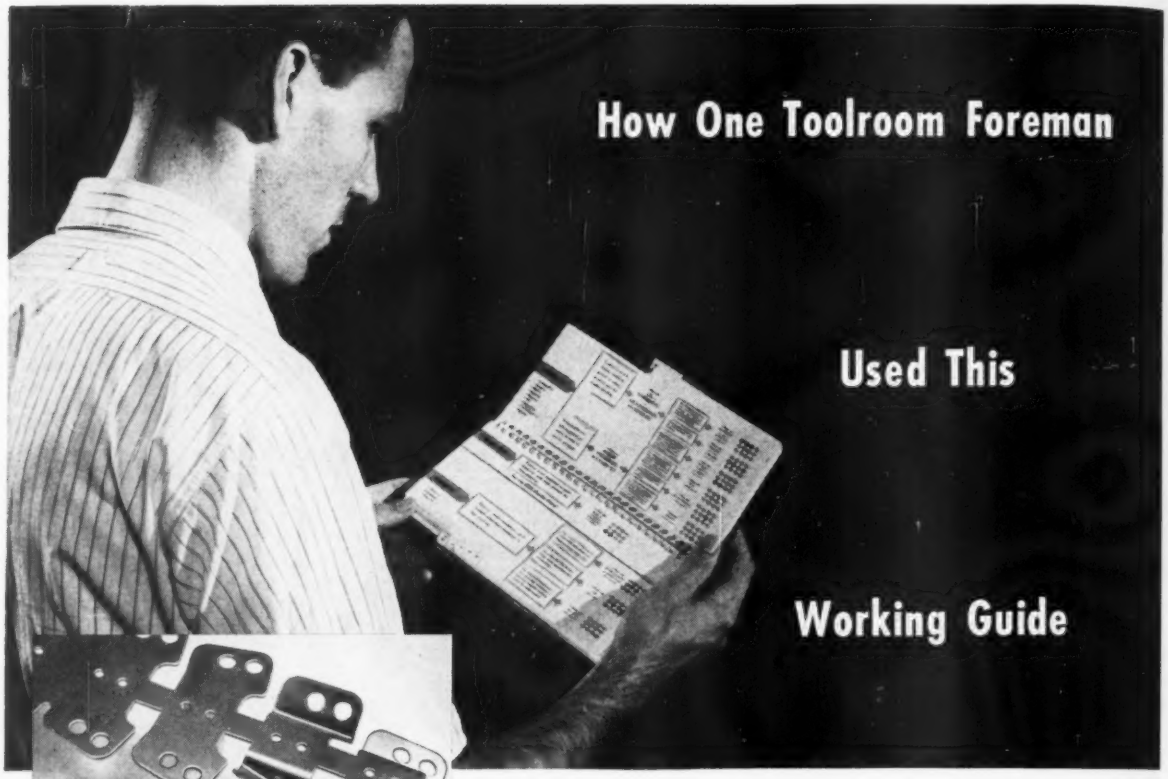


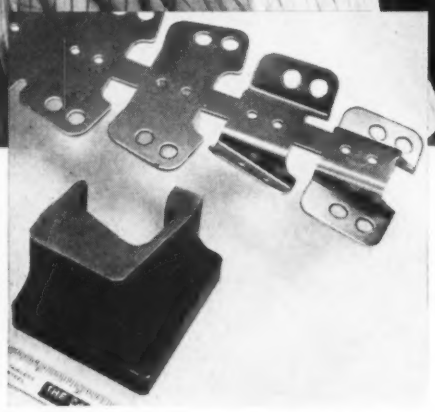


BUTTONING UP THE JOB PROPERLY. UNBRAKO Button Head Socket Screws, of course, provide a smooth, streamlined surface. They are strong, too. But equally important is the ease with which they can be inserted and withdrawn without marring the socket of the screw or the surface of the assembly. For the complete UNBRAKO story, see your authorized industrial distributor. Or write to STANDARD PRESSED STEEL CO., Jenkintown 36, Pa.

UNBRAKO® SOCKET SCREW DIVISION SPS JENKINTOWN, PENNSYLVANIA

CIRCLE INFORM-A-GRAM KEY NO' 39





Job: Punch that blanks stampings from SAE 1010 strip, .062" thick.

Problem: The punch is so unbalanced in design that safety in hardening is vital. Also, the punch is shear fitted to the die, and hardening accuracy is necessary to avoid expensive adjustments after heat treating. Other die steels were tried, but they either broke or changed size too much.

Solution: At this point the Toolroom Foreman called in Carpenter and started to become more familiar with the Matched Tool and Die Steel Manual. The Manual pointed to Carpenter *Vega* (Air-Tough) Die Steel for the punch. Now they're coming through right on the nose. Moreover, production between grinds has jumped from about 10,000 to 50,000 stampings. And the Foreman says that from here on, all his tools and dies will be made from Carpenter Matched Tool and Die Steels. (Write for a more detailed Field Report on this job.)

. . . To Increase Tooling Productivity

This is for the man responsible for tools and dies who looks at a diemaking job with these thoughts:

"How can I make it *easier?*"

"How can I avoid costly *heat treating hazards?*"

"What can I do to *improve the job?*"

If you're that man, Carpenter wants to help. We offer you plain, *practical* help based on almost 70 years' experience working with other men who feel like you do.

How does it pay off? Look at a typical example shown to the left! And your Carpenter representative can show you many more Field Reports of other interesting jobs.

Much of this help is packed into a 189-page working guide . . . Carpenter's "Matched Tool and Die Steel Manual". And that's only part of the program . . . a program backed by *dependable* die steels developed in Carpenter Research Laboratories with a long record of pioneering in new and improved steels.

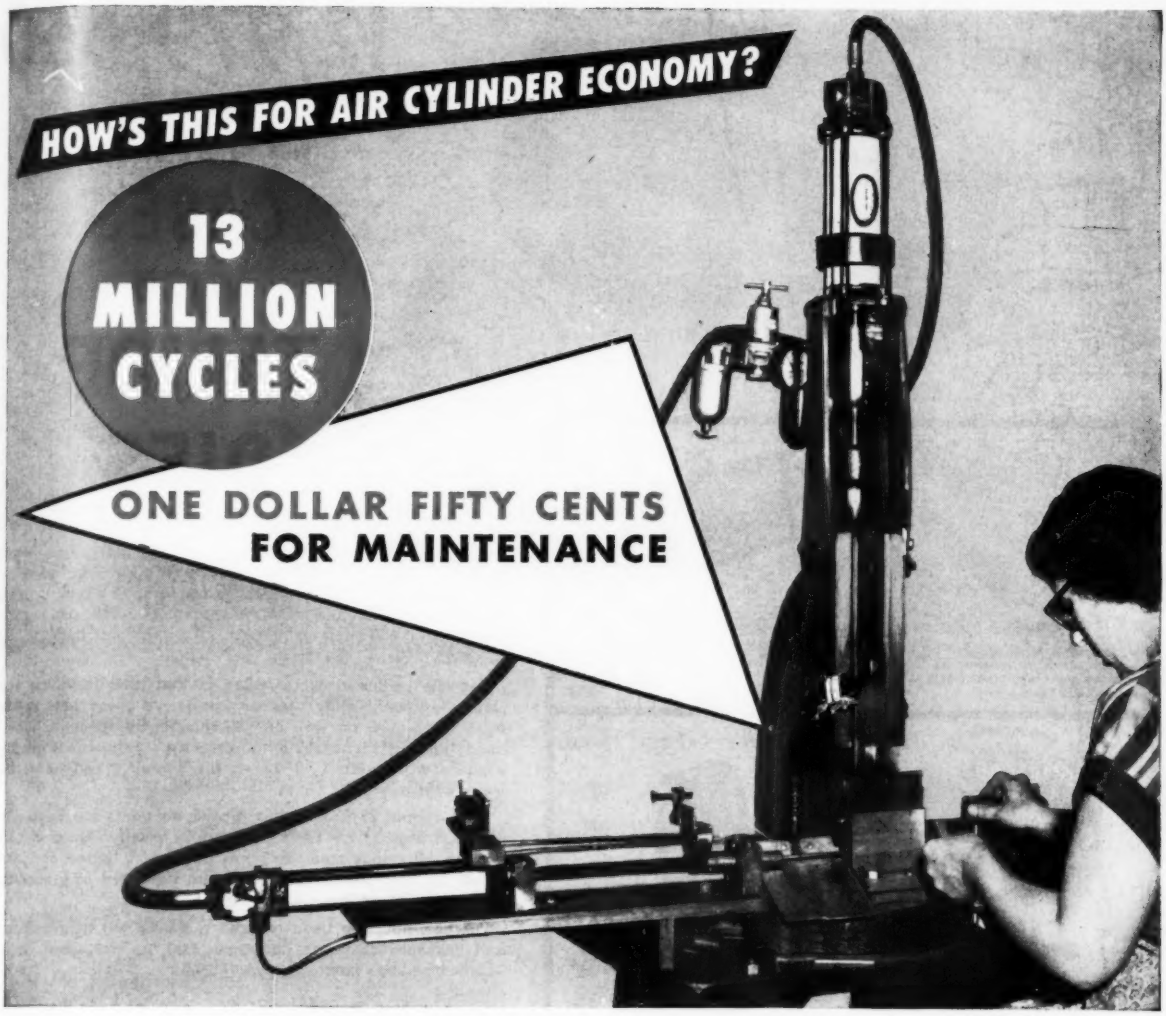
We're ready to work with you, now. A call to your nearest Carpenter Mill-Branch Warehouse, Office or Distributor will tell us you are, too. THE CARPENTER STEEL CO., 106 W. Bern St., Reading, Pa.

Carpenter STEEL — Matched Tool and Die Steels

IMMEDIATE DELIVERY from local warehouse stocks

Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

CIRCLE INFOM-A-GRAM KEY NO. 40



Even for the rugged, precision-built Bellows Air Motor, that's quite a record. But when Bob Daniels, Chief Engineer for Maugus Mfg. Corp., Needham, Mass., gave us the figures he was merely making specific what most users of Bellows Controlled-Air-Power Devices know — that, dollar for dollar, there's not better built air equipment made.

But maintenance saving is the least important part of this story. Bob Daniels designed the machine illustrated, to roll flat pieces of tin into tubing for brush handles. Two Bellows Air Motors form the heart of the unit. It cut the cost of forming tubes 75% — increased production from 5,000 pieces to 20,000 a day.

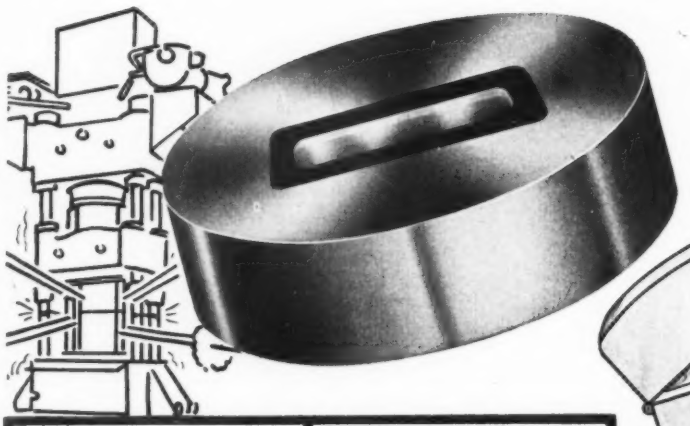
This is another typical example of the cost saving possibilities you can obtain with the Bellows Air Motor — the air cylinder with the built-in valve. Any manual repetitive push, pull or lift movement can be performed faster, safer, and at lower cost with this unique air cylinder.

Have you seen
OPERATION PUSHBUTTON?
New 16 mm sound movie shows how industries all over America use "Controlled-Air-Power." We'll be happy to arrange a showing for you. Write Dept. TP455

The Bellows Co.
Akron 9, Ohio
IN CANADA
Bellows Pneumatic Devices of Canada, Ltd., Toronto
1106A

CONTROLLED-AIR-POWER FOR FASTER, SAFER, BETTER PRODUCTION

CIRCLE INFORM-A-GRAM KEY NO. 41



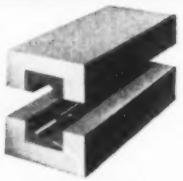
12,979,660 LIGHTER CASES WITH TALIDE DIES

A leading producer of cigarette lighter cases was experiencing considerable trouble using steel dies. An excessive number of lighter cases were being scrapped due to tears and deformation. Die cost was running $.028 per lighter. Operation involves drawing .020" thick carbon steel on A-3 Niagara presses, 45 strokes per minute.

Our die engineers were called in, and after installing specially designed Talide dies on customer's press line, rejects were eliminated, as well as time previously spent in buffing and polishing the cases after drawing. Subsequent plating expense was reduced ⅓ due to the smoother surface on the cases drawn.

The original 15 Talide dies placed in production have now drawn a total of 12,979,660 cases for an average life of 865,310 per die. Previous steel dies produced an average of 15,000 cases per die. Die life was therefore increased 58-1 after the installation of Talide dies.

Die cost has now been reduced to $.0008 per lighter drawn, and customer estimates his saving for the past year, using Talide dies, has been at least $25,000.

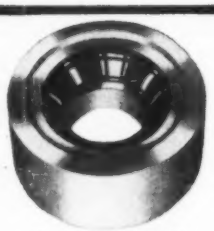


SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

HEADING AND EXTRUSION DIES

Cold-heading ¾" carriage bolts, TALIDE dies produced 1,500,000 pieces, steel dies only 50,000.



SHEET METAL DIES

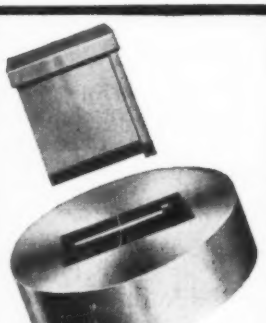
137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.

CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.

POWDERED METALLURGY DIES

Pill dies of TALIDE metal outlast steel dies 100 to 1 while reducing rejects 82%.



BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE—over hard alloy die.

IMPROVED QUALITY

Additional refinements and improvements in our process have added still longer life to the wearing edges of Talide tools, dies and wear-resistant parts. The result is a carbide having a new, unique grain structure with harder and tougher properties than previous grades. Laboratory tests reveal our improved grades possess 25% greater strength and rigidity. Service life per grind up to 50% longer than previous grades has been proven in grueling field tests.

"Year after year—you can rely on TALIDE METAL for uniform results and consistent quality."
METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 7, OHIO
HOT PRESSED AND SINTERED CARBIDES · VACUUM METALS
HEAVY METAL · CERMETS · HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY

Send for new 84-page Catalog 55-G or ask for sales engineer to call.

CIRCLE INFORM-A-GRAM KEY NO. 42

FOR 75 YEARS

Manufacturers of modern machine tools

SEVENTY FIFTH ANNIVERSARY
1880 BULLARD 1955

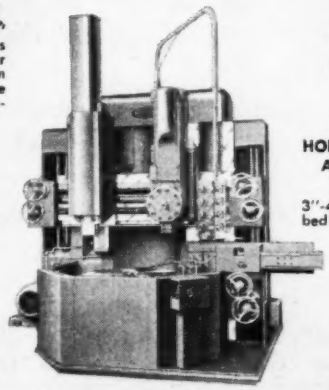
For three-quarters of a century it has been our privilege to serve industry — at home and abroad — with modern machine tools. Today, as in 1880, the name "Bullard" stands for advance design in engineering, quality of craftsmanship and reliable performance.

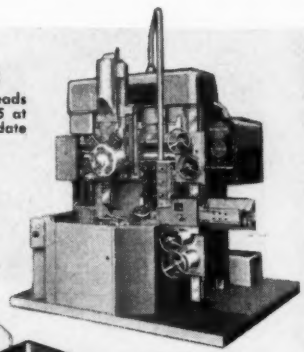
CUT MASTER V.T.L. Model 75
In six sizes, 26"-36"-46"-56"-66" and 76". The 26" and 36" sizes have two heads — side and either a swiveling turret or swiveling ram on rail. 46"-56"-66" and 76" have three heads in various combinations.

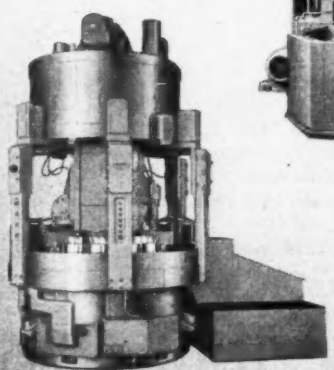
MULT-AU-MATIC
Type "L" — 10" with 6, 8, 12, or 16 spindles, 14" and 18" with 6 or 8 spindles.

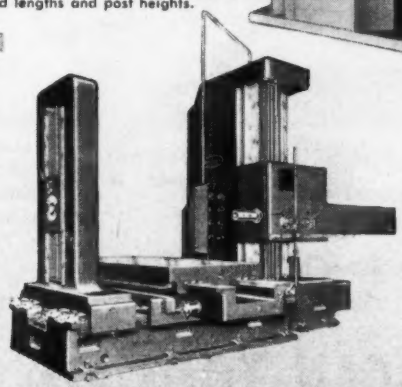
MAN-AU-TROL Model 75
May be applied to any or all heads of Cut Master V.T.L. Model 75 at time of ordering or at a later date for fully automatic operation.

HORIZONTAL BORING, MILLING AND DRILLING MACHINES, Model 75
3"-4" and 5" spindle with various bed lengths and post heights.









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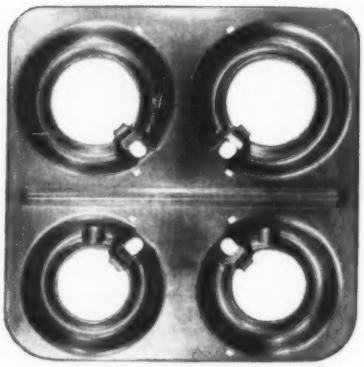
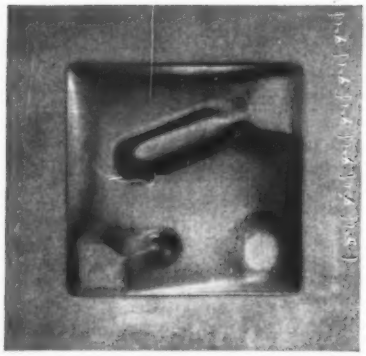
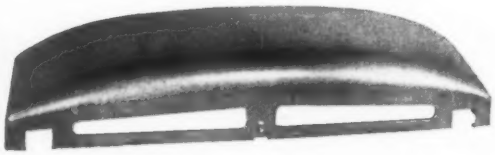
Plastic Low Cost Tooling

For

Dies · · · Drill, Welding, and Assembly Jigs







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Plastic tools are light in weight, have good impact, compressive strength and dimensional stability. No hand finishing of parts required as galling or marking is eliminated by using plastic form dies.

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Our actual production figures prove plastic has a definite place in modern production.

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Axelson announces the purchase of the Fray Line of Milling Machines and Milling Attachments which have been manufactured by the Fray Machine Tool Company, Burbank, California, for the past 14 years.

The milling machines and attachments are now being manufactured in the same plant that has built the world famous Axelson Heavy Duty Lathes, Precision Tool Room Lathes, and Special Machine Tools since 1915. The same engineering knowledge and skilled craftsmanship that has steadily improved Axelson Lathes will now be used to produce Axelson Milling Machines.

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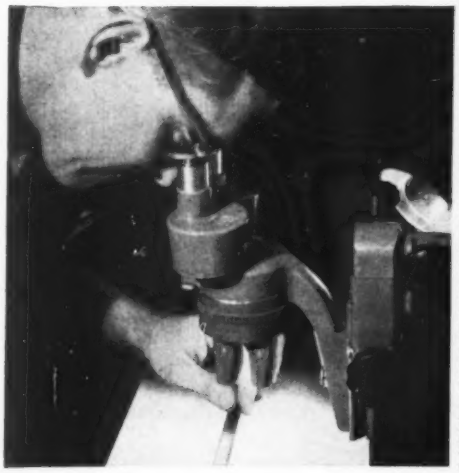
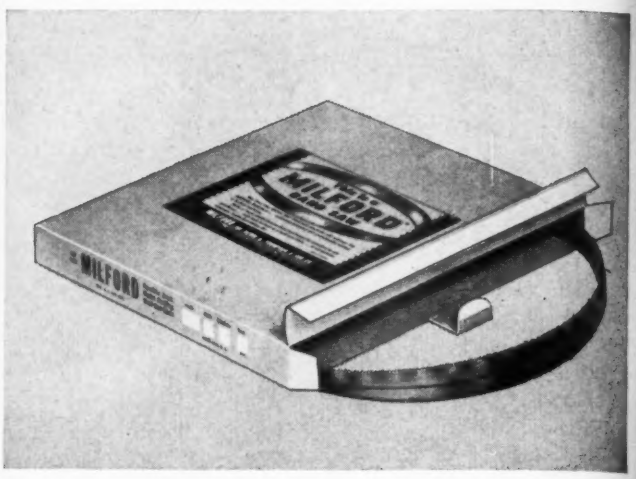
GOOD BAND SAW BLADES

aren't made ...in a HURRY!





that's WHY we take ...MORE CARE and use MORE INSPECTIONS making MILFORD BLADES

It might be metallurgically testing raw stock as it's received . . . checking the set while in process . . . straightening to insure straight cutting . . . or any one of numerous operations. But whenever extra care, or the substitution of a craftsman's skilled touch can contribute to added metal-cutting performance . . . MILFORD BLADES GET IT!

Yes . . . we build more into MILFORD Blades (even though they're available at competitive prices) and once you've tested a MILFORD Blade in your own plant, you will be another MILFORD user and booster.

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. . . a local business man, to . . .
SAVE TIME . . . *through local availability.*
CUT BUYING COSTS . . . *with one source of supply.*
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Saw Blade Specialists for over 75 Years
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Profile Blades and Band Saw Blades • Hand and Power Hack Saw Blades

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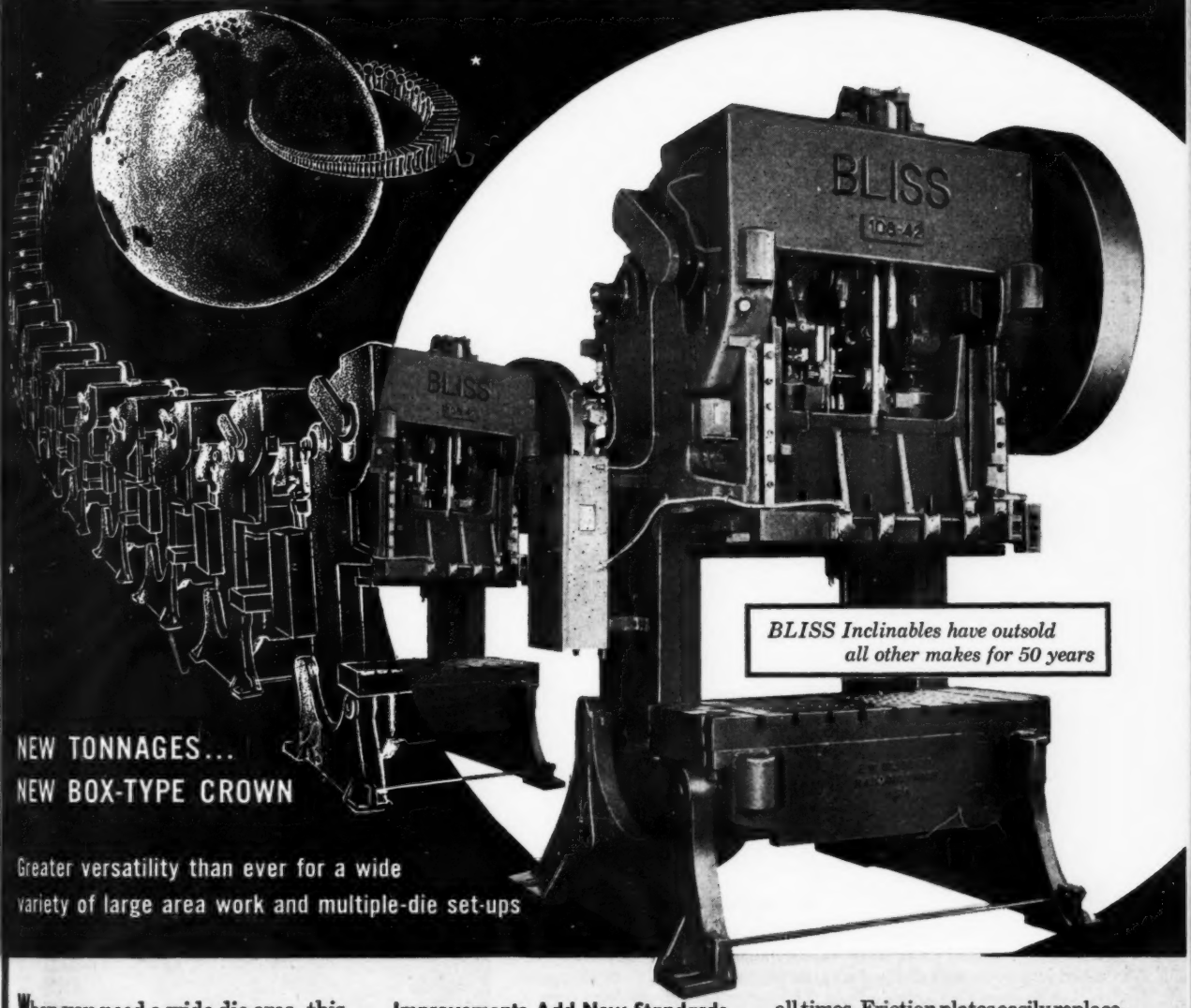
DOUBLE-CRANK INCLINABLE SERIES



BLISS Inclinables have outsold all other makes for 50 years

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Greater versatility than ever for a wide variety of large area work and multiple-die set-ups

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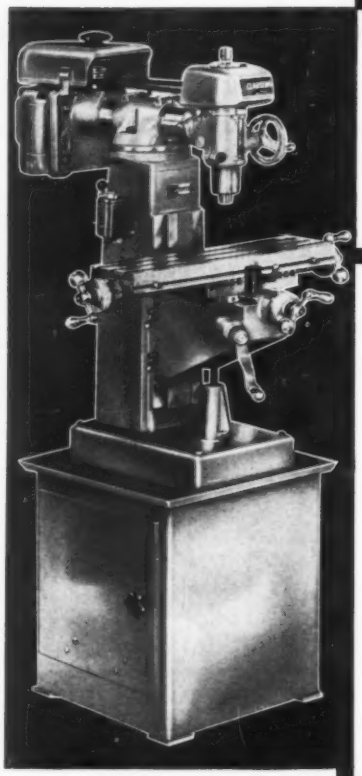

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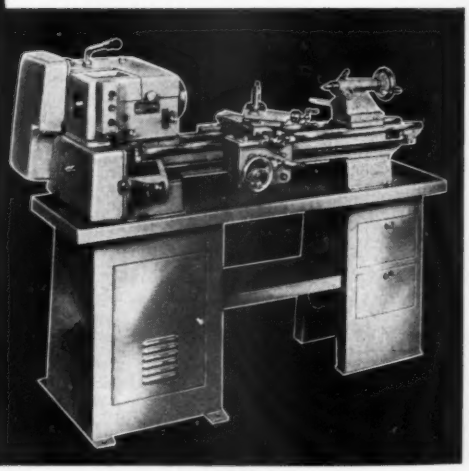

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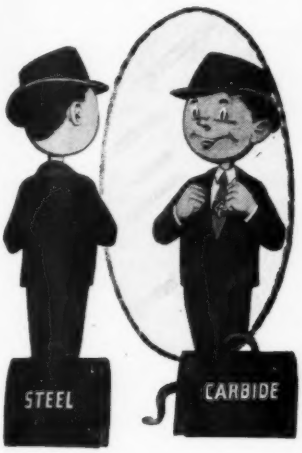

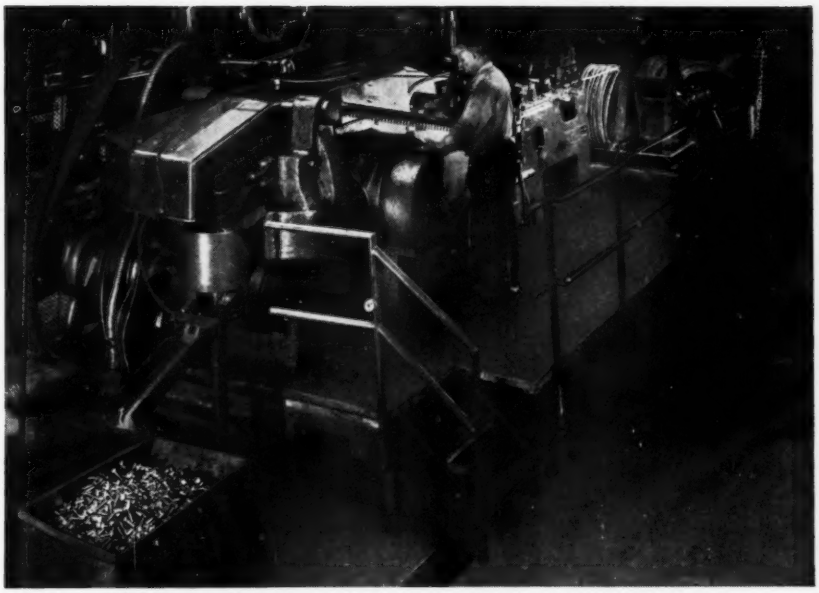

Photo shows automatic bolt maker. Courtesy of Oliver Iron & Steel Corporation.

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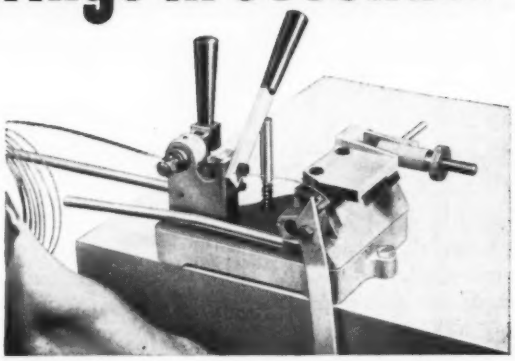

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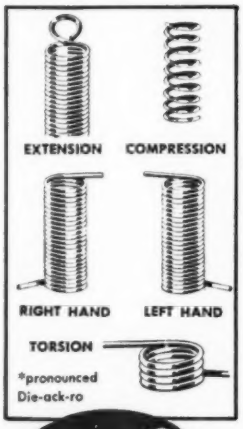

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FILES. "Toolroom Use of Swiss Precision Rifflers" by J. M. Roberts, Grobet File Co. of America, Inc. 73

Intricate die shapes, which are possible with recently developed casting machines, quite often require touching up in hard to reach places. Rifflers are the answer when the diemaker has such a job.

UNIVERSAL UNITS. "Packaged Units Reduce Design and Construction Costs of Automation" by Leonard Swanson Tool & Machine Products, Inc. 75

Standard pedestals and turret indexing units make up a basic chassis for special purpose machines. This has been developed as a packaged unit and can be used over and over.

RIVETING. "New Method Reduces Precision Riveting Costs" by Clinton A. Bay, Convair-Fort Worth, Div. General Dynamics Corp. 174

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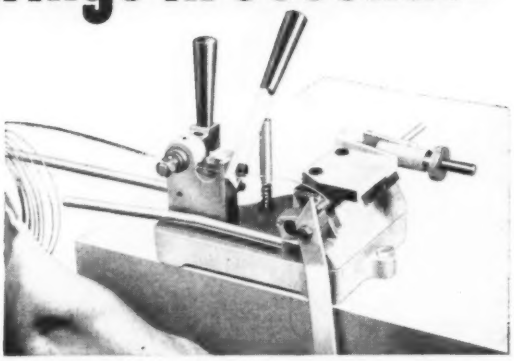

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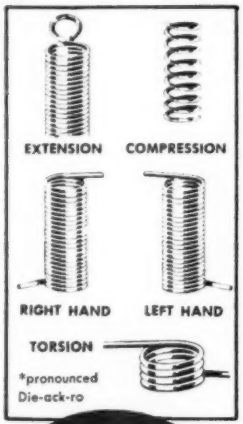

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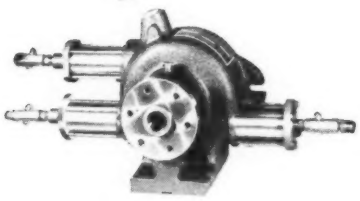
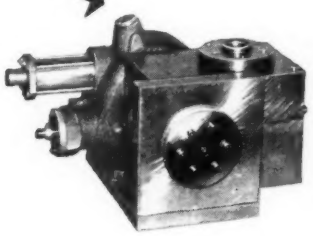


MODELS 400 and 600 ERICKSON SPEED INDEXERS Standard index plate provides 4, 6, 8, 12 and 24 positions. Special indexing parts are available to provide up to 100 positions. Two mounting surfaces provide for vertical or horizontal mounting.



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CIRCLE INFORM-A-GRAM KEY NO. 52

by *Henry D. Sharpe, Jr.*
President, Brown & Sharpe Manufacturing Company
Director, National Machine Tool Builders' Association

A Peek Under the Curtain at the September Show

A visitor to the 1955 Machine Tool Show in Chicago will find advancements in design considered next to unbelievable eight years ago, at the Dodge Chicago Show in 1947.

The curtain has not yet gone up, as you can well expect, on many of the startling new designs to be shown next Fall. Some of the companies, however, have given a foretaste of what is to come, indicating that the trend in machine tool design at the 1955 Show will be one of real progress.

The outstanding feature of the 1955 Show will undoubtedly be automation of different types of machine tools. For example, the visitor will see a Transfer Type Crankpin Grinding Machine with four grinding wheels and automatic transferring equipment. This equipment will pick up a crankshaft from a conveyor line, automatically locate the work in four successive grinding stations, grind to close tolerance, and place the finished work on a conveyor to be carried to the next operation — all without human effort. In the 1947 counterpart of this machine, the production rate was 10 V-8 cranks per hour, while the 1955 Show model has an output of 60 V-8 crankshafts per hour — six times the earlier production capacity.

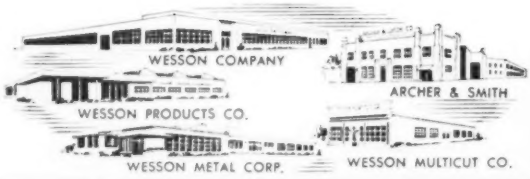
Another example of automation for the visitor to observe will be a fully automatic hobbing machine working through a combination of mechanical, hydraulic and electrical movements. After the machine is started, the operator only fills the hopper and removes the finished gears.

More automatic operations may be seen on a thread grinder capable of grinding a continuous thread 10 feet long on a workpiece 12 feet in length — a remarkable capacity. This is a completely automatic grinder, which includes feed to finish size, grinding wheel dressing, work size compensation for dressing, resumption of grinding cycle after dressing, and retraction of the grinding wheel at the end of the cycle.

Many improved and new types of automatic lathes will appear at the Show. One of these will boast a production rate eight times greater than the 1947 model. Another, with horsepower up to 150, promises 25% to 40% more production than the model presented eight years ago. Still a third automatic lathe boasts 50% production advantages over the corresponding machine shown in 1947.

More increase in productivity is not the only thing that visitors to this year's Show are going to see as an improvement over 1947. One company is showing a new Universal Grinding Machine, able to grind to extremely close tolerances not considered possible in 1947, and repeat them with complete assurance. Tracer controls, so prominent in 1947, will be found to have greatly developed since that time.

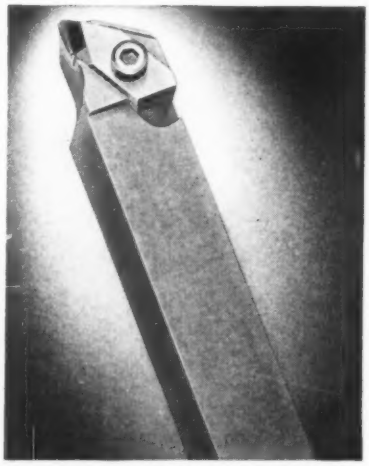
More tantalizing, even, than these semi-concrete promises of things to be shown at the forthcoming Show, are the many unrevealed advances which still remain behind closed doors in the Engineering Departments of America's machine tool builders. Although the general nature of many of the developments to be shown at the forthcoming Show are being talked about in the industry, a visit to the Show will prove, without question, that much of "the best is yet to come."



carbide NEWS

First Holder For 55° Throwaways Announced

Permits undercutting, contouring, turning, etc. in confined places



Special Wesson Multicut holder for diamond-shaped 55° throwaway inserts. The top of the locator and back-up plate can be seen below the end cutting edge. Chip breaker-clamp on top of the tip is adjustable. The holder and diamond-shaped inserts are specials. They broaden the standard "no grind" line of Multicuts, tips for which are shown below.

Wesson engineers have developed the first successful throwaway insert holder for use of 55° diamond-shaped inserts. The announcement was made following successful completion of tests.

The major problem preventing development of such a holder in the past has been the difficulty of locating and holding the thin insert securely while cutting. This has been overcome in the special Wesson holder by use of anvil-locator plates to both support and back up the tip.

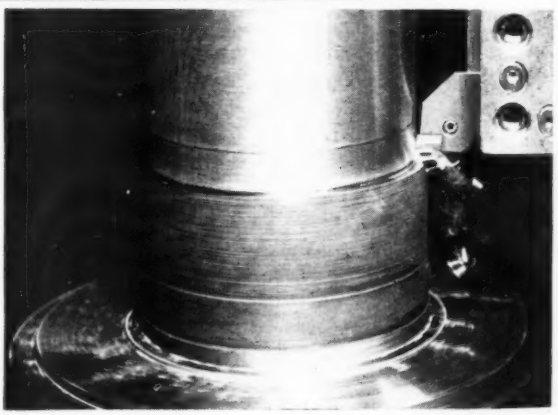
Big advantage of this new holder development is the ability of the holder to perform undercutting, contouring, turning and facing operations in confined places—thus extending the economies of "no grind" inserts to these tracer-lathe operations.

The holders and inserts are listed as specials and are in addition to the line of standard holders for round, triangular, and square inserts announced by Wesson last month.

Field tests on the new holder, listed as model MX-26-T6, include machining of the thread diameter on an SAE 8620 automotive stem pinion. Feed was .012-.014 in.; depth of cut 3/16 in. Average production per cutting edge was 623 pieces, or a total of approximately 2500 pieces per throw-away insert. Wessonmetal Grade WM was used for the insert.

Offset Multicut Holder Added to Standard Line

Particularly useful for combined turning and facing, Wesson Multicut band-type holders are now available in right and left hand offset styles (Models GAR and GAL). By angling the holder in the tool block 5°, the tool can be used for square shoulder turning and facing without resetting. It uses the standard Wessonmetal style D-80 solid diamond-shaped insert with 80° included angle. Ask for Bulletin GAR-GAL.



Metal-removal rate was boosted 33% and tool life per grind was more than doubled in the turning of the machine tool spindles by a large Eastern machine tool builder with this new standard Wesson Multicut offset band-type holder. Machine speed was unchanged. The spindle is SAE 1045 and 200 Brinell.

tools Wesson carbide Wessonmetal

Bulletin #552-M is now available from Wesson. It gives specifications, prices, etc., of the standard Wesson Multicut holders for throwaway "no-grind" inserts. Write to:

WESSON COMPANY, Dept. AD
1220 Woodward Heights Blvd.
Detroit 20, Michigan

CIRCLE INFORM-A-GRAM KEY NO. 54

TOOLING and PRODUCTION
The Magazine of Manufacturing Management

A New Manufacturing Process

PRECISION CONTOUR ROLLING OF METALS

by A. E. Felt, Chief Engineer

Aeronautical Division, A. O. SMITH CORPORATION, Milwaukee, Wisconsin

AS THE ANCIENT CHALDEANS developed the art of working copper, one of the first metals to be of service to mankind, so too, modern man continues to develop newer, faster, and less expensive ways to work all metals. And we at A. O. Smith Corporation, ever mindful of our company's prime aim —"Thru research—a better way", also continue in the research and development of metal processing.

You will remember that World War II brought about the need for larger and longer range bombers. These bombers required larger propellers for the higher power absorption. Steel propellers which are hollow, strong, tough, flexible, and light in weight solved the requirement admirably.

This required that the metal be efficiently distributed to give the blades minimum weight, high static and fatigue strength, adequate rigidity, and unfailing service reliability without possible failure. Steel had to be economically formed, with both heavy and thin walls coupled with both fast and gradual transitions from one thickness to another. These hills and valleys suggested but one thing—"contour" roll-formed plates of steel, with the various components welded together to become the complete propeller blade.

Our Aeronautical Engineering Group skillfully blended roll — forge — form — flash weld — and — fusion weld into a practical and workable process; not, however, without problems.

First, we used a double roll type mill with a die or "contour insert" in the upper roll (Fig. 1). This resulted in expensive die costs and lubricating problems, and necessitated a timing device for loading purposes (Fig. 2).

These problems hindered production. Because of this, the Draw Contour Roll type mill was designed (Fig. 3). However, while still in the design stage, our engineers realized they were gaining a flat bed on which to roll. Leaving the contour insert in the top roll would not lower the die cost, nor would it lessen the time consumed when correcting contoured inserts due to their circular construction.

At about this stage, the A. O. Smith Corporation acquired the rights to a rolling prin-

CONTOUR ROLLING is closely integrated at A. O. Smith Corporation with three other unique processes — precision forging and forming, flash-welding, and fusion welding — to economically produce lighter and stronger structures.

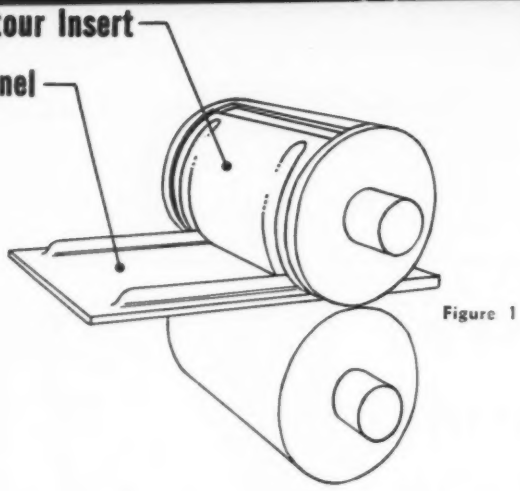


Figure 1

ciple invented by Mr. John W. Smith of Philadelphia, Pennsylvania. With his experience as a guide, our engineers now placed the "contoured insert" in flat bed dies leaving the roll smooth (Fig. 4). This proved to be one of the most significant factors in making the component construction method successful and practical. Bar stock and flat stock could now be used just as it came from the steel mill to make parts of varying thicknesses economically.

This method was used exclusively in the manufacture of the A. O. Smith hollow steel flash welded propeller blades used on the Consolidated B-36 bomber.

A propeller blade, like the fuselage, is marked off in longitudinal stations. Station dimensions always indicate distance in inches from hub centerline (Fig. 5).

The propeller blade made by the component construction method consists of 16 basic structural parts made from $2\frac{1}{2}$" to 6" round bar stock and $\frac{5}{8}$" to 1 1/16" plate stock. After forging, contour rolling, forming and simple trimming, these parts are joined by 14 flash welds and one fusion weld.

One edge and one center section will be described in detail. These two examples will be typical demonstrations of our "component construction technique".

The $3\frac{1}{2}$" dia. bar stock is purchased in mill lengths. It is then inspected; and, if found to be OK, it is sawed into 11" lengths (determined by tryout). See Figure 6 for sequence of operations on the No. 2 center section. If necessary, the production blanks are magnetically inspected for defects.

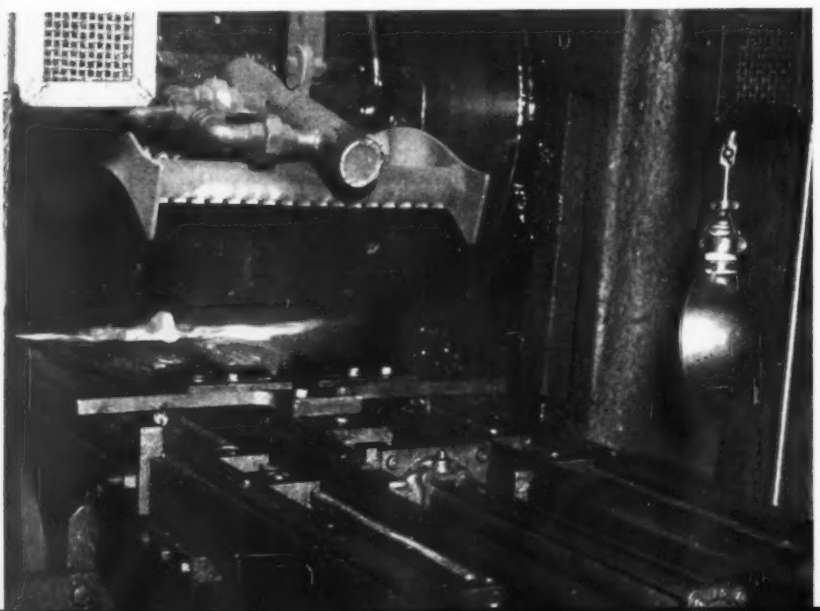
When the "sampling" proves a "lot" is ready for further fabrication, the steel blanks are grit blasted and burrs removed. After a caustic bath (minimum 2 minutes), they are placed in a saturated aqueous solution of barium chloride at 180°F and held for a minimum of one minute.

After draining, this bar stock for the center section is placed in a rotary furnace, one blank per muffle, and heated to 2350°F. The timing of the rotary furnace is such that when each muffle or compartment arrives at the loading position, the blanks will be up to forged heat. At the time the muffle door is opened, the cold blank is placed into the muffle; and the one up to heat is removed and placed in the forging die. The 9,000-ton press splash forges the metal drastically in one stroke as die cavities distribute the metal in proper relation for precision rolling.

The parts are again prepared in the caustic and salt baths as before first forge. After being brought up to forge heat in the rotary furnace, it is placed in the contour roll where the hot metal moves longitudinally and transversely under pressure of the 1,800-ton rolling mill. This moving of metal is quite like rolling dough under a rolling pin. Metal distribution is clearly apparent as shown in Figure 6.

Preparation is again made as before first forge. The part now is given its second roll. It is precision contour rolled to its full length, with a thin wall in the panels on either side of the center rib. The outer edges are heavier in stock thickness. This "buildup" area will later be used for flash welding and for fatigue loading protection.

A final forge operation completes the forge roll cycle of the No. 2 center section.



← Figure 2

Steel for the No. 2 trail edge made from 2" round material is prepared much in the same way as the center plate. Three forging operations and one precision contour roll are required to develop the solid trailing edge of the propeller blade. These steps may be followed in Figure 7.

After all dimensional and butt scarf machining along with pre-assembly inspection is completed, the two center components shown in Figure 8 are flash welded together; next, the trail edge component is flash welded to the center sub-assembly; then the lead edge component is flash welded to this sub-assembly.

It will be noted that, at the time the lead and trail edges are flash welded, two welds—to face and camber sides—are made simultaneously. In each instance, flash is removed by a vertical-ram shaper or broach type machine. All longitudinal flash welds follow the same procedure. Four components—face center plate, camber center plate, lead edge, and trail edge have been flash welded into a completed center section, bottom view of Figure 8.

These sub-assemblies are machined on each end in preparation for transverse flash welds. Starting with the root-to-shank flash weld, each weld is made in succession until four transverse welds are completed. Length of blade is controlled by machining each part prior to welding. Flash is entirely and smoothly removed after each weld is made.

The tip is the only fusion weld—accomplished with the aid of a special chill—on the entire blade. Upon completion of four flash welds and one fusion weld, the blade is flat and untwisted (Fig. 9).

In Figure 10 this hollow steel propeller blade has been taken through its major manufacturing sequence. An important finishing operation is the heat treating, inflating, and twisting treatments. Hardness or strength of metal must be controlled precisely in all airframe components. This is especially true of the A. O. Smith hollow steel propeller blade for, at full take-off power, the blade tip approaches the speed of sound; consequently, excess weight (metal) has many objectionable and detrimental effects.

The air foil twist and metal hardening is done in a multi-purpose integral unit composed of (1) an electrical furnace, (2) a hydraulic press, (3) a gas generator, and (4) a water cooler. The blade is mounted on a mandrel or stem which elevates the blade into the atmospherically controlled furnace and is heated to 1650°F. It is then lowered into the integrated and synchronized double action toggle-hydraulic press. The mandrel passes through the open die inserts and, when it reaches its proper position, the die is closed around the hot blade.

Instantly, inert gas is introduced into the blade under an initial pressure of 1,000 psi and, within four seconds, is reduced to 50 psi. As the die closes, it automatically, with the help of gas inflation, forms the air foil and twist.

These die inserts are made to the exact shape of the air foil and twist with shrinkage compensation. Quench cooling rate is accomplished by (1) spraying the root with water maintained at 150°F, and (2) the die mass cooling the thinner portion of the blade. At its ultimate stroke, the "press" exerts a maximum pressure of four million pounds applied to the external surfaces of the blade for forming, twisting and support of the inflation pressure (Fig. 11).

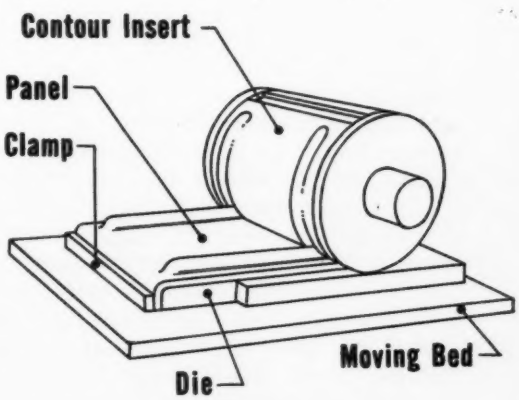


Figure 3

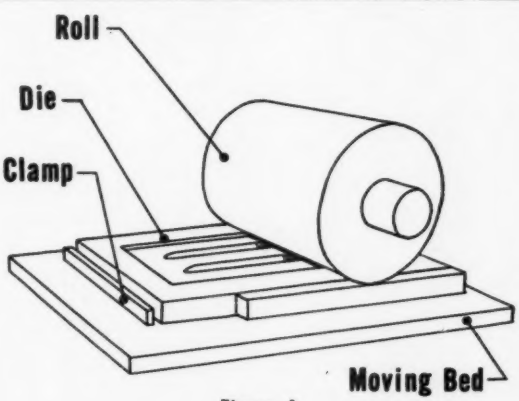


Figure 4

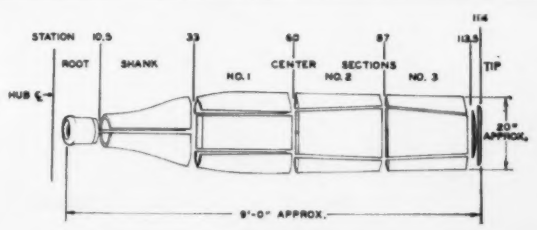
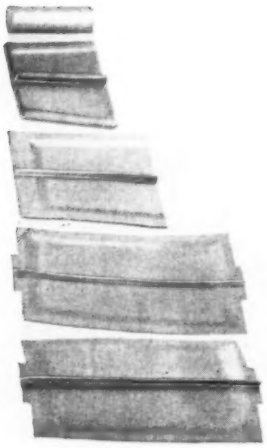


Figure 5

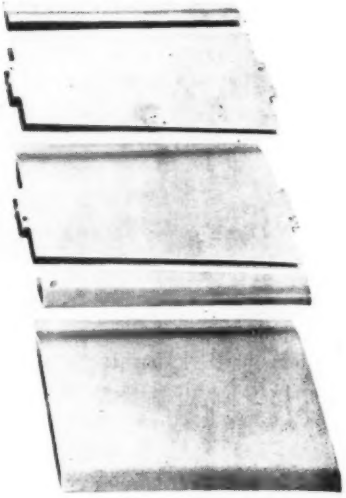


No. 2 Center Section
Blank, First Forge, First Roll, Final Roll, Final Forge

Figure 6

No. 2 Trail Edge
Blank, Pre-Slug, Slug, Final Forge, Rolled, Coin Radius, Coin Buildup

Figure 7



No. 2 Center Section Ass'y
Center Plate Ass'y, Trail Edge Ass'y, Completed

Figure 8

Each component is selected for each blade assembly according to its static weight. This will control horizontal balance as the blade moves through the assembly stages.

Control of balance is important during all stages of assembly. Stock thickness has been established in the parts to maintain optimum thickness control throughout the entire structure; any appreciable amount of grinding to bring the blade assembly into balance would destroy the stock thickness control which is inherent within this process. The need for balancing by means of stock removal at a time when it is difficult or impossible to measure and protect wall thickness, is prevented.

Vertical moment is directly related to the manufacturing centerline alignment and the centerline selected for retention machining. The dimensional control used in making individual components maintains control of vertical moment; again without destructive, dangerous, and costly grinding of surfaces.

After all operations including root machining, plating, painting and final balancing by means of segments in the balance cup, the blade is ready for delivery (Fig. 10).

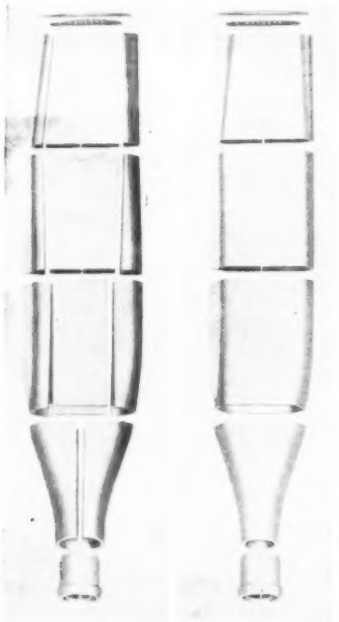


Figure 9

Figure 10

Figure 11

Figure 12

From left to right—Figure 9, all welds exploded and transverse welds exploded: Figure 10, pre-quenched: Figure 11, quenched: Figure 12, finished.

The Adel Division of General Metals Corporation has long been a leading manufacturer of hydraulic equipment for the aircraft industry. The company's production consists largely of items made of alloy steels — mainly, those of the heat-and-corrosion-resistant group. Numerous parts requiring periodic runs are produced in a large automatic screw machine department and a variety of tooling problems have been encountered. Here are some of the problems and their solutions.

Cast Alloy Tooling for Automatic Screw Machines

by Nelson B. Spellman
Senior Foreman, Screw Machine Division
ADEL DIVISION, GENERAL METALS CORPORATION
Burbank, California

PARTS PRODUCED BY the automatic department in the main have two major requirements: (1) close tolerance, and (2) fine finish (16 to 100 microinches).

Some of our machines are capable of high spindle speeds, while others are much slower. Some operations apparently called for high speed steel tools, which can be used only at relatively low speeds; and with automatics the speed of the cycle is often governed by the slowest tool.

With some machines, we also have the problem of rigidity.

One of our major problems in both form tool and cutoff operations has been to find a tool material that will withstand the impact of interrupted cuts — particularly in such extreme applications as plunge cuts into hex and square bar stock.

These problems apply to approximately 60% of our automatic production, and we have spent much time in devising tooling that will satisfy the tolerance and finish requirements and still perform satisfactorily on all machines at any speed range.

Tried All Types of Tool Materials

We first experimented with various grades and makes of carbide, as inserts for all types of form tools. Such tooling worked satisfactorily on rigid machines operating at high spindle speeds, but excessive chipping and consequent tool failure occurred when conditions were less favorable.

Next, we tried high speed steel of all types. That solved the chipping problem. However, the combination of low abrasion resistance and limited spindle speed made these materials impractical for general application in our plant.

We then turned to cast alloy and, after many trials, decided that this material was the answer to the problems at hand. We tried several different grades of cast alloys made by each of several manufacturers; and, after extensive experimentation, we decided that Crobalt No. 2 was the material best suited to our particular needs and conditions. Subsequent production records have substantiated that decision.

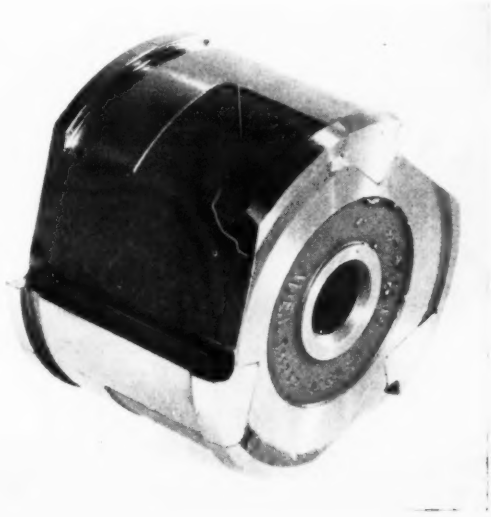


Fig. 1. This cast alloy insert 3-place circular form tool is run on a No. 2G Brown & Sharpe automatic in machining 1⅛" No. 1018 Shelby tubing at 280 sfpm. Width of cut is 1.55", to a depth of 1/16". Tool life: 2000 pieces per place, or 6000 pieces for the entire tool between grinds. On this job with carbide insert tooling excessive chipping was experienced due to the width of cut, and the number of pieces per grind averaged about 50% of that with cast alloy.

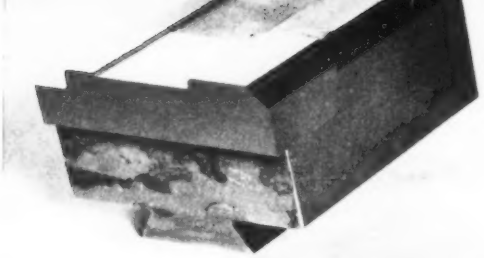


Fig. 2. A cast alloy insert dovetail form tool used in machining 1 1/4" dia. No. 440 Type C stainless steel on a 3 1/2 M Acme-Gridley single spindle automatic. Width of cut, 1.840"; depth, 3/16"; at a speed of 190 sfpm. Whereas the previously used hss tool ran only two hours per grind, at 85 sfpm, this cast alloy insert job rings up six hours between grinds.

Typical Cast Alloy Form Tools

Our experimentation with cast alloy inserts for form tools was preceded by an extended trial of simple form tools ground from solid square or rectangular tool bits. The signal success of these trial tools led to the making of circular form tools, and then to the dovetail design.

The performance of all three types of cast alloy form tools has added considerably to the efficiency of our automatic screw machine production. Three typical form tools with inserts of Crobalt No. 2 are shown in Figures 1, 2 and 3, along with their respective application and performance data.

Other Applications

In view of the success we have had with cast alloy form tools, we are now using cast alloy box tools and balanced turning tools in a number of operations. We are also having good results with cutoff blades of Crobalt No. 1 cast alloy, particularly on abrasive materials. In addition to the metals mentioned above, we are using cast alloys successfully on aluminum, beryllium bronze and naval brass.

Fig. 3. A form 0.750" wide and 0.185" deep is cut in 5/8" dia. SAE 52100 steel at 175 sfpm with this 3-place circular tool running on a No. 2G Brown & Sharpe automatic. Production per grind is 185 pieces per place, or 550 pieces per tool. Previously, a hss tool gave 20 to 25 pieces per grind at 85 sfpm.

Our cast alloy cutoff blades are of the hollow-ground Acme-Gridley type. High speed steel was previously used, and a typical performance comparison can be cited on the parting of 1 3/4" square SAE 1018 commercial grade hot rolled bar. The high speed steel cutoff blade averaged 15 parts per grind, while the cast alloy blade averages 80 to 90 parts.

The cast alloy form tools and cutoff blades perform very satisfactorily on plunge cuts into both hex and square stock. In the latter application, the depth of feed is reduced about 50% as compared to HSS, with no change in spindle speed.

Making Inserted Form Tools

The cast alloy inserts are cut by us on a radial wheel to the desired size from standard square or rectangular tool bits purchased in such lengths as to assure the minimum of scrap. Our tool bodies for inserted form tools are made of SAE 4140 heat treated steel. Practically all of these tools are made in our own plant and ground by our grinding department.

Generally speaking, the inserting and brazing of cast alloy is very similar to carbide practice. We use larger inserts than with carbide, and also preheat both the insert and the tool body. With thin inserts, most of the heat should be applied to the body. We use a shim of 0.010" copper between the insert and the steel, as in carbide practice.

Grinding

Cast alloy inserts are rough ground with a standard vitrified wheel of 40 to 60 grit, and finish-ground on a similar wheel of 80 to 100 grit. Expensive diamond or green wheels are not required for grinding cast alloy.

Cast alloy inserts may be ground either wet or dry, with wet grinding recommended if equipment is available. However, most of our tools are ground dry. In so doing, we are careful to allow the tool to air cool rather than to immerse it in water. Water quenching involves the risk of checking the tool, which could run to considerable expense with a complicated form tool. It is unlikely that the red hardness of cast alloy will be affected by dry grinding.

Cost

We have found that the cost of making circular and dovetail form tools of cast alloy inserts is less than making either carbide-inserted or solid high speed steel tools. Cast alloy is considerably lower in price than carbide and is easier to grind, accounting for the price differential over carbide inserted tools. The cost of material for solid high speed steel tools is about 50% higher than the combined cost of cast alloy inserts and SAE 4140 steel bodies.

Monarch Machine Tool Co. *employs portable test unit to locate and measure vibration in complete machine . . . ends reliance on "calibrated fingertips". Instrument permits fast dynamic balance in defective part's own bearings.*

Grinding wheel used in production of Monarch precision engine lathes is checked for imbalance. Filtering probe and pickup in operator's left hand convert motion of vibration into electrical current, which actuates electronic displacement and amplitude circuits in instrument cabinet, firing stroboscopic light in his right hand at the frequency of the vibration.

VIBRATION-FREE MACHINE TOOLS

. . . Product of Routine Vigilance Using Electronic Vibration Analyzer Unit

PIONEERING ADVENTURE in what was once the wilderness of dynamic balance has grown into a settled routine in the factory of one of the nation's leading lathe builders.

For years, engineers, production men, and inspectors of the Monarch Machine Tool Co. of Sidney, Ohio, had followed the standard practices of the machine tool industry in their effort to build vibration-free lathes. And, as in any top-notch machine tool factory, they were enjoying considerable success because of strict care in design and production of the thousands of precision parts.

However, all concerned realized that in an industrial world which was depending less and less on the fallibility of human senses, they still had to use their "calibrated fingertips" to find out whether a completed lathe was ready to ship.

A skilled inspector could tell by touching the lathe during its run-in tests whether it was vibrating enough to produce unsatisfactory work, wear out faster, and need frequent repair. He set himself up, in effect, as a "go, no-go" gauge.

But he could not tell with any certainty why an unsatisfactory lathe was vibrating. He could say the trouble probably lay in the headstock, or probably in the drive motor, or probably in this gear or that one.

In many cases, he was right, but at best — and nobody realized this more than the man doing it — he was giving an "educated guess". To find out for sure, the lathe must be torn down in a laborious hunt for the part out of balance.

There was always an additional hazard. "Calibrated fingertips" were no better than the man owning them. That is, if he had a cold or other infection, if he had circulatory troubles, if he had a headache, or even if — and many a plant superintendent knows of this — he had had a big night out with the boys

by Theodore Ongaro
Vice President

INTERNATIONAL RESEARCH & DEVELOPMENT CORPORATION
Columbus, Ohio

or a quarrel at home, he was not the same man who tested the lathe yesterday. His responses varied directly with his physical, mental, and emotional condition, and every industrial psychologist knows there are as many variables as constants involved there.

The situation logically called for some machine, some instrument, not subject to human ills or frailties. It called for an instrument that would tell how much vibration was too much . . . would make it possible to set up tolerances for vibration as well as physical dimensions . . . and always give similar readings under similar conditions. It called further for one that would locate the vibration, pinpoint it to the actual part that was causing it, analyze all the vibratory forces at work in the machine, yet accept for interpretation only the important one, the predominant frequency.

And finally it called for an instrument that would make it possible to balance that part, not in some fixed static or dynamic balancer elsewhere, but in its own bearings, in its full working relation to all other parts of the machinery. This, and this alone, could give complete assurance of a machine — a lathe or any machinery with rotating parts — **being balanced as a whole.**

Such an instrument became available in recent years, and Monarch was among the first users.

The instrument is a portable electronic vibration analyzer, or, as it was called when first designed, a vibration discriminator. Although it is little bigger than a portable typewriter, weighs under 40 lbs, and can be taken to any vibration problem, the instrument is packed tightly with electronic circuits and tubes which enable it to give the following information simultaneously:

1. The displacement of the maximum component of vibration, or the actual physical motion created by imbalance.

2. The frequency of the maximum component of vibration, or the actual speed at which the part is shaking.

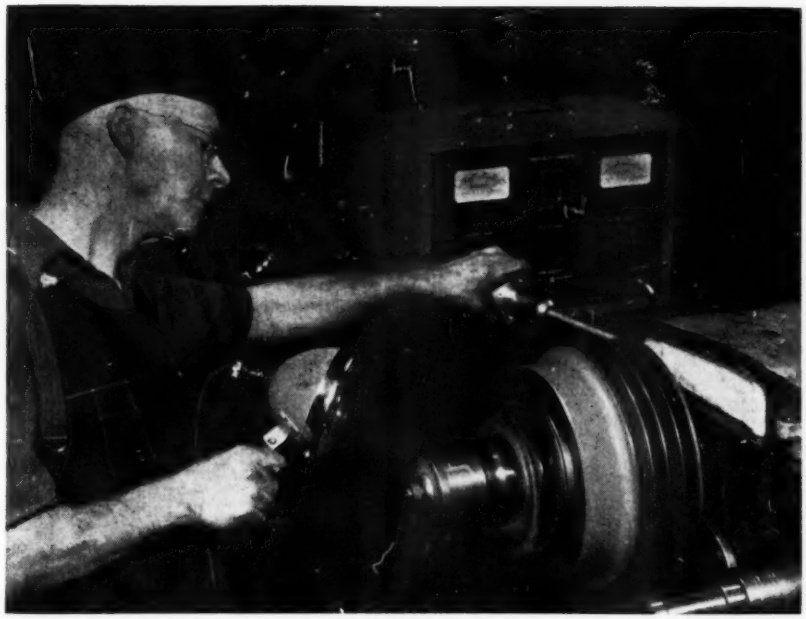
3. The phase of imbalance, or the exact point where the part is out of balance.

With this data, an operator can quickly trace out the cause of the vibration, however hidden, in any piece of machinery, simple or complex. And, by following a simple four-step procedure, he can balance the defective part, at its normal operating speed, and usually in its own bearings and in its normal operating relation to all other parts of the machine.

With this instrument, manufactured by the International Research & Development Corp., Monarch has developed an inspection routine which infallibly stops the occasional vibrating lathe as it comes off an assembly line, before shipment. And it further makes possible on-the-spot adjustment, thus assuring the customer of vibration-free operation of the lathe.

The routine is quick and simple because of

Checking a new lathe before shipment from Monarch plant. With electronic vibration analyzer, operator can tell quickly if lathe is within vibration tolerances at key points.



Early model vibration analyzer still in service at Monarch, helping to keep plant equipment and product vibration-free.

the speed with which the instrument finds any trouble and presents its information.

The inspector, holding the instrument's seismic pickup with filtering probe in one hand and a flashlight-type stroboscopic lamp in the other, first checks the drive motor. In the Monarch lathes these vary in speed from 1,200 to 3,600 rpm, far below the instrument's capacity of 40,000 rpm.

The pickup, sensitive enough to detect vibration down to 0.000001" displacement, feeds its data into the electronic circuits for rendering on panel-mounted displacement and frequency meters. At the same time, the electric impulses — generated in the pickup by the vibration — trigger the stroboscopic light at the speed of the vibration which, of course, is the speed of the motor. Thus, the light "freezes" the vibratory motion for visual observation of its phase and intent.

If the inspector finds the motor vibrating, at either end of the shaft, more than 0.0006" peak-to-peak, he follows the prescribed procedure for balancing.

Next he checks the pulley shaft, repeating the same motions.

With these points checked, he has covered 90% of the probable sources of vibration in almost any lathe.

But this is not enough. The inspector proceeds into a quick program of vibration analysis on the rest of the machine. He checks the V-belts, and if they are defective, off they come for replacement. He checks the sheaves, which Monarch makes itself. Unbalanced sheaves go back to the shop.

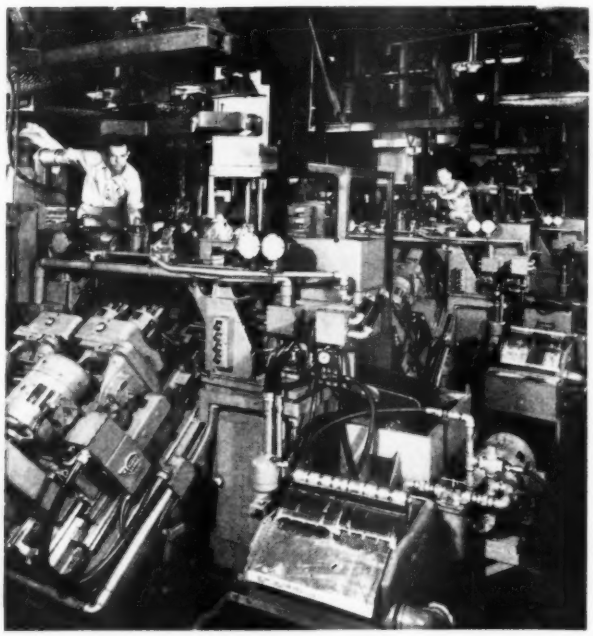
Any imbalance in gears, spindles, and other rotating parts is quickly spotted, since the inspector can check the frequency picked up by the vibration analyzer against design speeds of various parts. Thus, if the instrument shows an unsatisfactory amplitude of vibration at, say, a frequency of 800 cycles per minute, he knows, or can quickly find out by referring to blueprints, which part turns at 800 rpm. With the vibration analyzer, the Monarch inspector does not guess . . . he knows.

Monarch has found other uses for the vibration analyzer. It is on call for trouble-shooting of production equipment throughout the firm's modern, streamlined shop. It is used to check and balance such machinery as grinders, boring mills, radial drills, and virtually every other type of machine tool entering into the job of building Monarch lathes.

The vibration analyzer also goes out on trouble calls. The field service staff takes it along when a customer asks for help, and more often than not, the instrument shows that the vibration complained of comes from outside the lathe. The versatile sensitivity of the vibration analyzer enables it to trace out tramp vibration created by other machines, production or plant equipment, which is conducted to the lathe by sympathetic resonance through floors, girders, posts, etc.

Monarch still uses the original vibration discriminator and has added the latest model vibration analyzer. Kenneth S. Bogart, assistant superintendent in charge of the Assembly Division, comments:

"I don't know what we'd do without them."



Dynamic balancing machines final-check each assembled engine at 700 rpm, with a drill—automatically adjusted to the proper depth—removing metal from counterweights to offset the imbalance.

SEGMENTED AUTOMATION-

Feature in "Production Line of Tomorrow"

CHEVROLET recently unveiled a few of the advanced automation features of its production line turning out 1955 Turbo-Fire V8's at its new engine plant near Flint.

Here in this million square-foot plant, "segmented automation" and dynamic engine balancing combine high speed production with electronically controlled inspection to turn out an ultra-smooth running engine.

A battery of specially developed dynamic balancing machines assure that no engine will be out of balance more than ½ oz at a radius of one inch from the center of rotation of the crankshaft. An electronic "brain" records the over-all imbalance of the engine at 700 rpm, and simultaneously adjusts an automatic drilling unit to the depth required to offset the imbalance. The drill cuts into counterweights forged onto either end of the crankshaft.

Whereas conventional production relied solely on balancing individual parts within specified limits, actually permitting an undesirable accumulated imbalance, the present method corrects this by balancing the engine as a unit in addition to the balancing of individual parts. Any accumulated imbalance can now be detected and corrected.

The "segmented" feature of the automated line — like the "sectionized construction" advocated by others — has as its objective elimination of the primary disadvantage of con-

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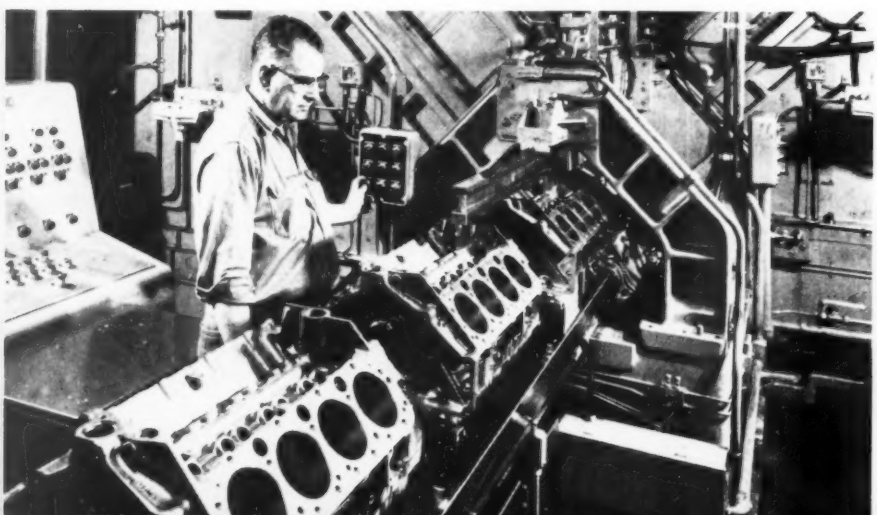

Multiple-spindle boring machines take engine block through six stations for semi-finish and finish boring. Blocks are subsequently passed into a Micromatic honing machine for finishing cylinder bores to 0.0002".

Figure 1.

by

W. M. Halliday

Southport, England

ARBOR AUTOMATICALLY LOCATES PARTS

A simple yet unusual arbor — designed to locate taper-bored sleeves so that the successively machined parts are always in the same endwise relationship to both the register face of arbor and the pre-set cutting tools which produce the outside annular grooves.

THE WORKPIECE ILLUSTRATED in Figure 1 discloses the quite difficult locating and holding requirements which have to be met in machining the part all over and to close limits.

This part is a cast bronze bearing sleeve, having a long conical bore (A), the small end of which terminates in a very short parallel portion and an enlarged shallow recess. The exterior of the sleeve has to be machined perfectly concentric with the tapered hole, and embraces the two critical annular groove formations (B) and (C).

The right-hand outside end of the sleeve is conically formed as at (D). The wide groove (B) with 10° inclined sides, has to be situated distance (X) from the machined face (E) to a very close tolerance. Likewise, the narrow groove (C) is located distance (Y) from face (E) to equally close limits.

Considerable difficulties were experienced when having a very large quantity of these sleeves to machine in the above manner. The problem involved the manner of holding and locating successive sleeves, after the boring of the conical hole, so as to produce the external annular grooves in the most accurate, rapid and economical fashion.

Each casting was first chucked by its right-hand end (D) for trueing face (E) and machining the long tapered hole (A) by the usual means of a boring tool and a finishing reamer. The latter insures producing all holes to the required accurate taper and to a good surface finish. No critical tolerances are called for by the major and minor diameters of the hole.

Next, each was chucked by its left-hand end in order to face the opposite end and to machine the shallow recess therein, concentric with the tapered hole within wide tolerances.

The final, and critical machining of the exterior of each sleeve involved mounting the part upon a mandrel or arbor so as to locate it by the tapered hole. It was found that ordinary tapered solid mandrels or arbors were unsuitable, because successive workpieces could be pressed into substantially different endwise positions thereon. Thus the form tools for producing the annular grooves (B) and (C) had to be re-set for each piece in order to

Fig. 2.

maintain the critical distances (X) and (Y) to the specified close limits, and to bring grooves truly concentric with the bore.

This procedure of machining proved extremely slow, tedious and uneconomical on the large batch of parts needed at regular intervals. Moreover, it was a source of frequent and costly errors due to inaccurate location of the grooves. Hence an unduly high scrap rate of partially machined castings was experienced.

The Automatically Self-locating Arbor

To avoid these errors, and losses in production time, an arbor of unusual design and construction was developed for use in the lathe. Its operating and work-locating features are particularly simple, yet embody a most unusual principle which is capable of wide application to many other types of work-holding machining or grinding fixtures.

In Figure 2 which illustrates the features and manner of using this uncommon form of arbor, (A) is the main body of the device. It is made of hardened and ground steel, and includes the enlarged shoulder (B) and the Morse taper shank (C) at the left which fits the live spindle of the machine. A tapped blind hole (D) is provided for the usual draw-bolt to retain the arbor securely within the driving spindle.

The hardened and ground steel sleeve (E) is finished to slide closely over the cylindrical body (A). The exterior of the sleeve is turned to fit the tapered bore of the bronze bearing casting (X). This sleeve is made about ½" shorter than the length of the workpiece and has a short sliding movement along the body (A) but is restrained from rotating thereon in the following manner.

An elongated slot (F) is machined diametrically through body (A) near its right-hand end. The width of this slot is slightly greater than the diameter of the hardened steel shoulder stud (G). This latter is located perpendicular to the longitudinal axis of the body within holes drilled diametrically through the walls of member (E). One of the holes is tapped for the threaded end of the stud, which is thus easily locked in position as shown.

The ends of the stud terminate slightly below the conical surface of the sleeve (E) so as to clear the bore of workpiece (X). The length of slot (F) is about three times the diameter of stud (G) to permit sleeve (E) to slide on the body (A) for a distance of at least twice the diameter of stud (G). Thus mounted, the member (E) should slide very smoothly and easily.

A deep blind hole (H) is drilled centrally into the body (A) from its right-hand end. Mounted within that portion of the hole to the left of the stud (G) is a powerful coil spring (J) whose end bears upon a shallow flat machined across the adjacent side of stud (G). The purpose of the spring is to urge sleeve (E) to the right, and to the limit of its travel as determined by stud (G) contacting the end of slot (F), when no workpiece is mounted on the arbor.

A short portion (L) of the end of body (A) is reduced slightly in diameter and externally threaded for the hexagonal lock nut (K). A thick, C-shaped washer (M) is normally situated between the nut and the adjacent end of the workpiece over hanging sleeve (E). The maximum diameter of nut (K) is made slightly less than the minor diameter of the workpiece (X) so that upon removal of washer (M) the workpiece may be drawn off the arbor without having to remove the nut completely from (L). In actual practice to lock or remove a workpiece will require only one or two turns of nut (K).

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TOOLING & PRODUCTION
Air Power
FOR METALWORKING

HIGH PRESSURE PNEUMATIC DIE CUSHIONS

THE GENERAL TREND in selecting die cushion equipment is toward higher available tonnages with respect to press capacity. The old rule of thumb for selecting a die cushion was a force available of one-sixth the rated capacity of the press. Present practice indicates a trend toward cushioning to one-fourth the rated press capacity.

The higher cushion capacity can be obtained in several ways: (1) The cushion diameter can be increased to the extent of the available room in the press, (2) One or more cushions can be stacked on top of one another, necessitating construction of a pit under the press or requiring the enlargement of the pit if one is already available. The third and obviously the most economical method, both from initial cost and maintenance cost, is to increase the working pressure of the die cushion. Hence, the development of high pressure cushions was a natural evolution to the trend in pneumatic punch press equipment.

The pneumatic die cushion, Figure 1, basically is nothing more than a compressible air container. Air pressure acts upon the end areas of the container to offer a resistance to movement. This resistance is utilized in punch presses to hold the material during the drawing cycle and to strip the shell from the draw punch.

One of the distinct advantages of the pneumatic die cushion over other means of doing this job is the fact that a constant, or nearly constant, force can be exerted throughout the

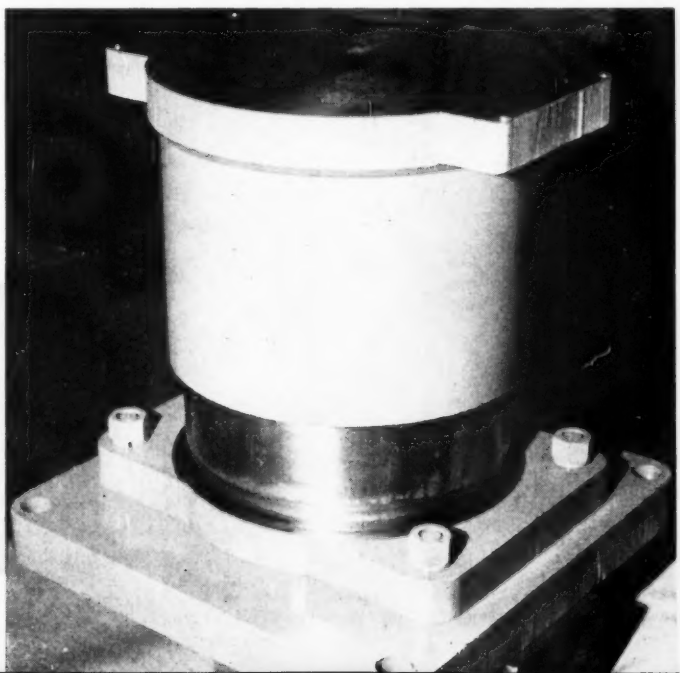
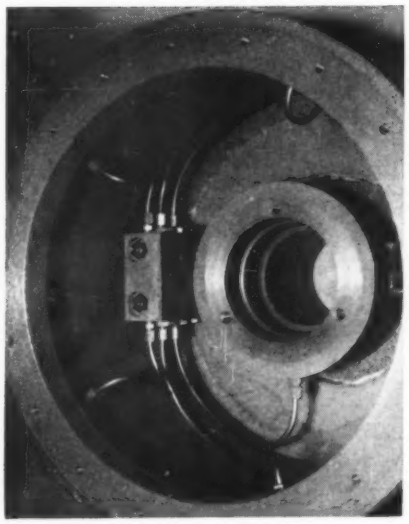


Fig. 1. Model H pneumatic die cushion is all wrought steel welded and normalized construction with Tobin bronze bearing surface between the piston and cylinder to give the finest resistance to galling and wear.



Piston showing centralized lubrication system which conveniently distributes lubricant to all points of wear through one entrance fitting.

entire stroke or draw. In order to accomplish this, the pressure in the cushion must be held nearly constant. According to Boyle's Law ($P_1V_1 = P_2V_2$) the total volume of air in the system must be kept as nearly the same as possible at the extreme positions of travel. The larger the volume before drawing, the less effect the change of volume will have on internal pressure. For this reason, surge tanks are generally added to the system to supplement cushion air volume.

The Model H die cushion developed by Dayton Rogers Manufacturing Company is built in sizes from 8" bore — 5-ton capacity to 24" bore — 45-ton capacity at 200 psi. It is constructed of fabricated steel throughout with a Tobin bronze overlay on the mating bearing surfaces. An improved self distributing lubrication system, Figure 2, enables all lubrication to be performed from one conveniently located fitting, assuring even distribution of lubricant to all points of wear.

Normal shop air pressure is all that is necessary for operating this high pressure equipment, since a booster pump, furnished with each installation, boosts shop line pressure to the required pressure in a ratio of 2 to 1; that is, the booster pump, when supplied with 100 psi, will deliver an output of 200 psi.

A schematic representation of the general hookup of the pneumatic cushion with booster pump and surge tank is shown in Figure 3.

The booster pump, Figure 4, is a self contained automatic air pumping unit. Its primary function is to increase shop air line pressure. It is also an air pressure regulator, controlling its output pressure at any setting up to two times input pressure.

By means of built-in valving, the pumping feature of the pump can be shut-off. This enables the cushion (or other work unit) to which the pump is connected to be operated at any desired pressure from zero psi to approximately two times shop air line pressure.

The pump is completely safe; materials used in its construction are the best available. It has a minimum safety factor of 10 throughout, but the manufacturer warns that the rest of the equipment in the system should be capable of withstanding the high pressures to which they may be subjected.

This pump has unlimited application possibilities for use with a great variety of pneumatic equipment requiring a high pressure — low volume source.

Fig. 3. Schematic representation of the general hookup of the cushion with booster pump and surge tank. Pump furnishes air at desired pressures up to 2 times shop air line pressure. As cushion is compressed the air in it is transferred into the surge tank. This holds a nearly constant pressure in the system.

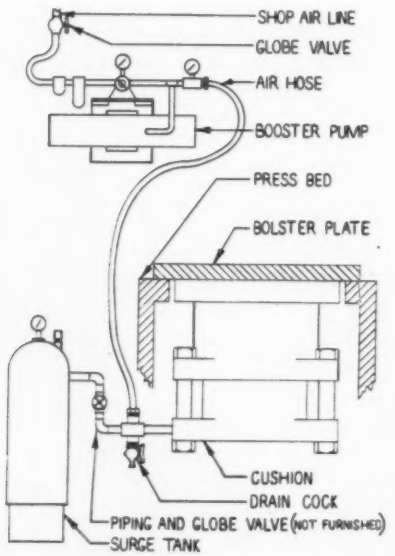
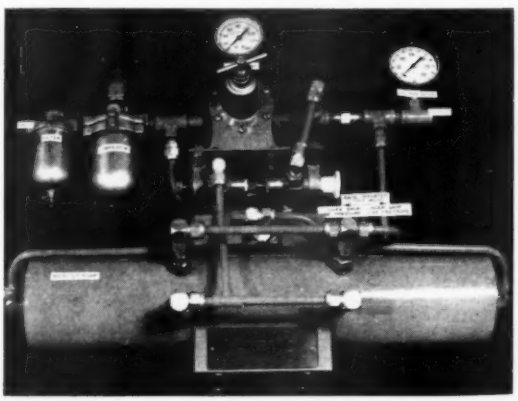


Fig. 4. Booster pump is a self-contained automatic air pumping unit used to increase shop air line pressure.



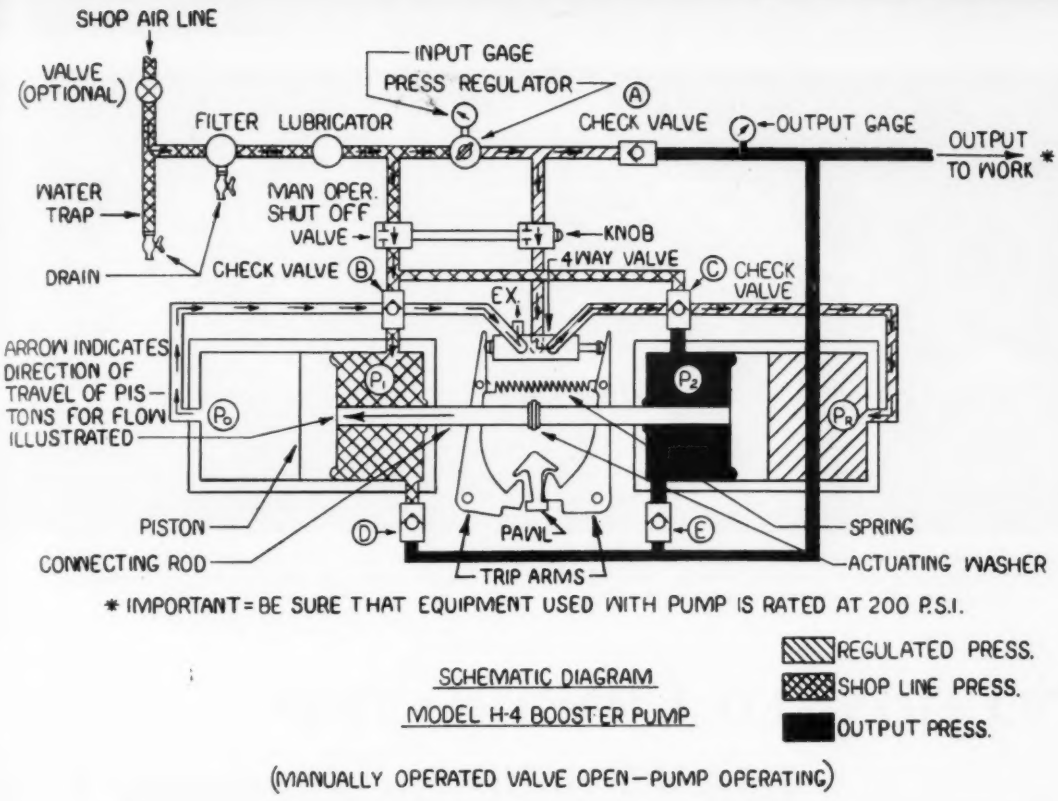


Fig. 5. Schematic Diagram of the booster pump showing the position of the different operating parts when the manually operated valve is open and the pump is operating.

How Pump Works

The following equation illustrates how the pump boosts air pressure (See Fig. 5) (Assuming constant areas in the chambers of the pump)

$P_0 + P_2 = P_1 + P_R$ where

P_0 = atmospheric pressure = zero
P_2 = output pressure
P_1 = shop line pressure
P_R = regulated pressure

Since P_0 = zero, pump will operate until P_2 is equal to $P_1 + P_R$. It will then stop cycling until the output pressure is decreased. If regulator is set so $P_R = P_1$ then $P_2 = 2P_1$, or the output pressure approximates twice the shop line pressure.

Reversing Mechanism

Automatic reversing of the pump travel at the end of each stroke is accomplished by a trip mechanism actuated by the piston rod.

Figure 6 shows various stages of a reversing cycle. An actuating washer forces one trip arm to pivot, pawl is also forced to pivot. This releases opposite trip arm, which pivots due to action of spring and forces 4 way valve to shift. Cycle is then reversed and the same operations take place in the opposite direction.

The pump is a highly efficient mechanism — using the air in the inner chambers to do work before it is compressed.

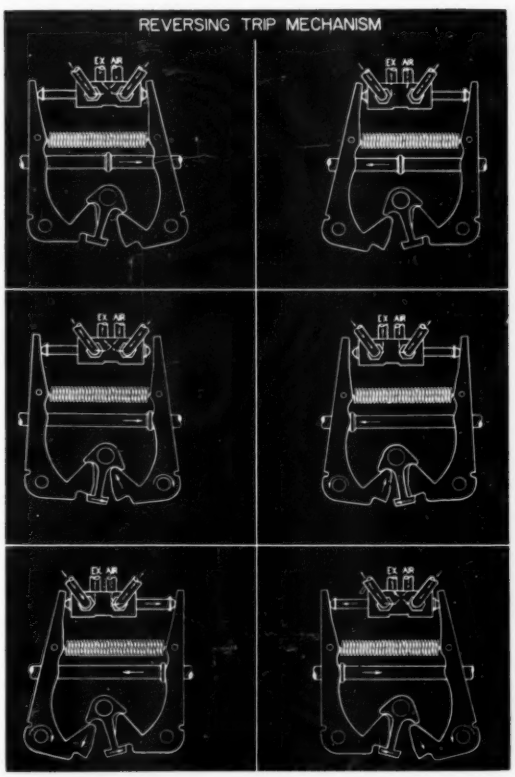
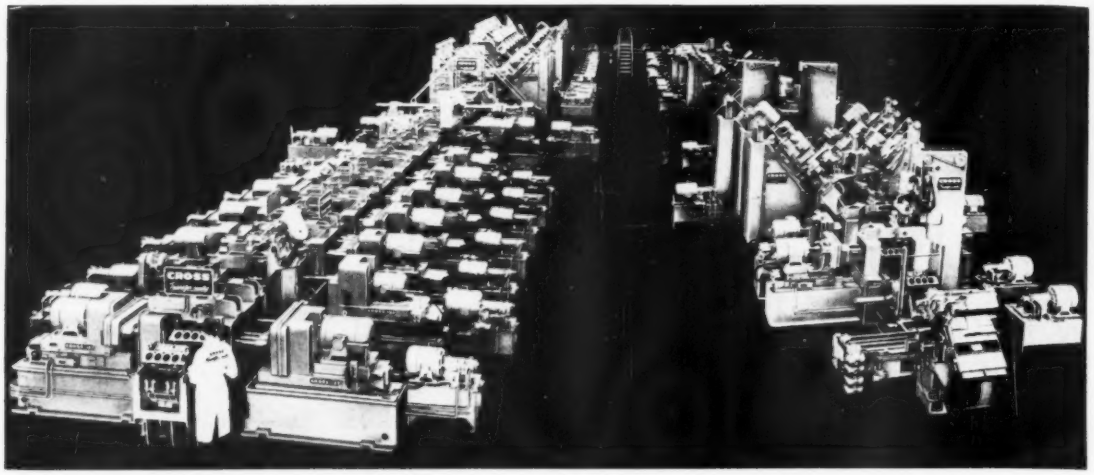


Fig. 6. Automatic reversing of the pump travel at the end of each stroke is accomplished by a trip mechanism. Various stages of a reversing cycle are shown.



A 350′ transfer machine — a fully automated production line for machining V-8 cylinder blocks. Sections can be independently cycled, thereby eliminating shut-down of the entire line and reducing lost production for reason of tool changes or machine trouble.

SECTIONIZED CONSTRUCTION

Adds Flexibility to Automated Line

TOMORROW'S MACHINE TOOLS should be modern versions of Aladdin's Lamp. In production terms this means more productivity combined with more flexibility.

So spoke Ralph Cross, executive vice president of The Cross Company, before a recent conference on machine tools sponsored by the American Institute of Electrical Engineers. Cross was fast to say that flexibility is not wanted by all, but was firm in his opinion that machine tool builders must provide more flexibility before automation will be universally accepted.

Modular construction — building special machines from building blocks, standard interchangeable units — offers one route to the achievement of such flexibility. Way-type feed units, hydraulic power units, drill units, indexing tables, wing bases, and bed sections are typical components . . . standard . . . that can be put together with other components . . . standard and special . . . to form special-purpose machines. Use of standard units can reduce the mortality on costly high production lines; in the future they will make possible product changes with a minimum of tooling time.

Sectionized construction — dividing an integrated, and fully automated production line into short machine sections with "banks" of workpieces between — offers another route to

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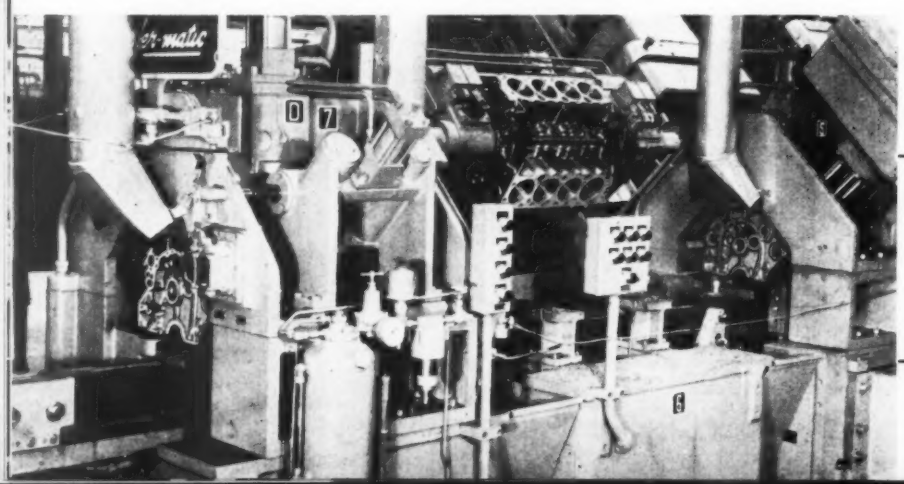

One of many automatic inspection units for checking bank faces. If the part does not pass inspection, the section is shut down until the difficulty is corrected.

Grade Selection for Carbide Milling

by Melvin L. Backstrom
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MILLING MAY BE defined in a general way as being that machining process by which material is removed by multiple cutting edges developed on the periphery of a tool which rotates about its own axis.

"Carbide Milling" is a generic term which describes the milling process when performed with carbide as the cutting tool material.

When the geometry of the workpiece, the work material, and manufacturing facilities permit, carbide milling is the most efficient of all known machining practices. Greater volumes of material can be removed in a given period of time, work loading can generally be simplified, machine operating time can be at a maximum because of simplified tool setup and extended operating time between tool changes, surface finishes can be developed which otherwise require grinding, and dimensional accuracy can much more readily be achieved.

The successful application of carbide milling has been achieved because of widespread recognition of the problems involved by carbide manufacturers, machine tool builders, milling cutter manufacturers and last, but not least, production minded management.

Because of the recognition given the problems and the advantage resulting from its use, the evolution of carbide milling was probably the most rapid of all the carbide applications currently accepted and widely used.

Just as a number of the generally accepted practices for single point tool applications had to be modified when carbide was applied to turning, many practices had to be reconsidered and modified for carbide or "hyper" milling. Factors that are insignificant when carbon or high speed steel is used as the cutting tool material achieve major proportions and in some cases become limiting factors when carbide is used.

To plan and develop a successful carbide milling application, it is necessary to thoroughly analyze each individual milling problem as it presents itself. This analysis should result in the determination of:

1. Physical size and shape of the cutter including the type of head, shape of teeth, and the number of teeth.

2. Machine limitations including rigidity, horsepower consumption, work holding fixtures, feeds and speeds, and anticipated production.

GRADE SELECTION FOR CARBIDE MILLING.

Type of Failure	Probable explanation	Grade recommendation or modification
Edge Wear	High cutting speed for material to be cut	Harder non-ferrous cutting grade—regardless of material being machined
Cratering	Heavy tooth loading, high speeds	Harder crater resistant grade
Chipping	Mechanical impact	Softer grade — either ferrous or non-ferrous
Cratering & Chipping	Heavy tooth loading	More crater resistant grade (Chipping probably result of crater forming near, and weakening the cutting edge)
Edge wear and chipping	Application of improper grade of carbide to ferrous material resulting in edge wear and formation of built-up edge which is systematically removed taking portion of cutting edge.	Ferrous grade of carbide
	High cutting speed developing heat which is responsible for thermal checking and chipping.	Softer grade and reduce cutting speed
Edge Wear and Cratering	Balance of feed and speed	Harder grade — ferrous cutting material

3. Grade of carbide which will most economically remove that material which is excess to the required shape and form of the finished part.

4. Maintenance facilities required to produce and maintain cutting tools.

5. Operator skill which must be furnished to operate and maintain production schedules.

Because of space limitations it is impossible to discuss in detail all of the foregoing considerations, and the balance of this paper will discuss only what might be done to improve tool life with respect to the grade of carbide selected for a particular or individual application.

As is necessary with any material selection problem, it is necessary to reduce that problem to its most simple form. The best way in which this may be accomplished is to reduce and limit the scope of analysis to the possible or probable causes of eventual tool life limiting factors.

Possible or probable tool life limitations of any cutting tool material in their most elementary form may be described as wear and/or stressing at or about that region of the tool which is performing the primary function of shearing or tearing away material from a workpiece.

When each or both of the conditions occurs, it is necessary to recognize their physical form and to recognize the possible and then the probable cause. Once each of these is determined, a solution based on other limiting factors must be developed.

Wear is, at best, a rather nondescript term which may result from a number of causes. Typical of the causes are:

1. Erosion or the mechanical wearing of the surface . . . generally, but not necessarily, by the rubbing of a hard surface on a softer surface.

2. Corrosion or the wearing away of a surface or surfaces as a result of chemical activity.

Probable causes of wear by erosion are friction and high temperature. It might be added that friction develops heat and that corrosion, a chemical reaction, is promoted by heat.

Wear exhibits itself on a cutting tool in the form of edge wear and or cratering. Wear will be predominant on that surface on which the highest temperature is generated.

The other possible, and much less recognizable, cause of eventual tool failure might best be described as "stressing". Probably the reason for the fact that it is much less recognized is the fact that it occurs in an indeterminate quantity in an undisclosed area. This condition does not become evident until the ultimate stress is developed in the form of cracks or fractures. Even then it is quite easily disguised.

Basically, stresses are developed as a result of:

1. Mechanical impact.

2. Thermal stresses developed in the cutting tool prior to or during the application.

To apply this reasoning to the selection of a suitable material for carbide milling, it is necessary to briefly review the milling application and determine which factors are most applicable.

Wear and stressing are both developed in varying degrees. Frictional wear is much less a problem in milling for example than in single point turning applications because each individual tooth is in contact or rubbing against the workpiece for a relatively small percentage of time. Resultant edge wear, even though it is a limiting factor, will be much reduced as compared to a given quantity of metal removed in a given unit of time by a single point tool.

However, because of the fact that the tool is alternately heated and cooled during the machining cycle and subjected to interrupted cutting which is inherent to the milling process, both mechanical and thermal stressing are predominant and major factors. Build-up or welding of the chip to the top surface of the tool, which on occasion may be used to advantage in single point turning, is a distinct disadvantage and must in all cases be minimized.

There is no such thing as a continuous milling cut and every contact made by an individual tooth with the work represents a mechanical shock.

Cratering, which in single point turning of the less ductile materials is a result of temperature and mechanical pressures, is not nearly so important in milling. This can be attributed to the fact that the temperature developed during one tooth contact has time to be somewhat dissipated during the non-active part of the rotation of the cutter and the necessity of reducing mechanical impact by generally finer tooth loading than is common to single point turning applications.

In addition, because of the fact that every cut is naturally interrupted, it is not necessary to apply chip control mechanisms which automatically increase tool loading.

Thermal stressing may result from several basic causes. Included are: tool making, or the

. . . *Continued on page 206*

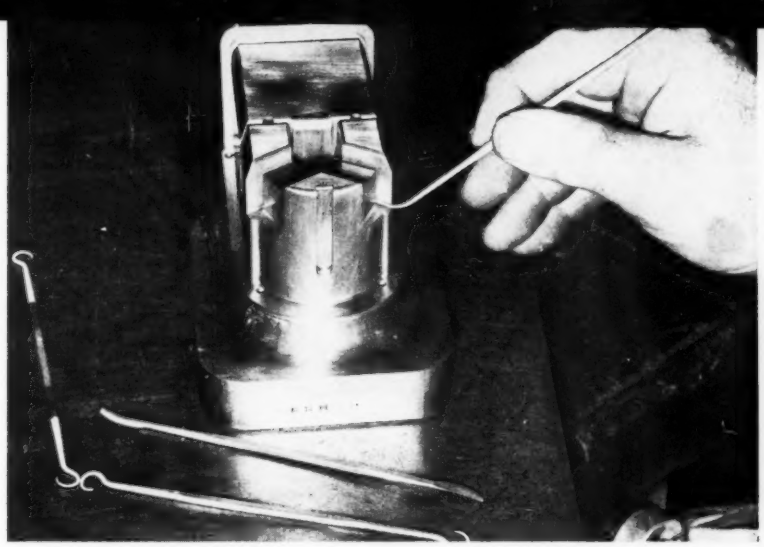


Fig. 1. Removing a bit of metal on a force for a mold of an electric receptacle. In this delicate filing operation the diemaker has selected a Grobet die sinker riffler #1, cut 2. For other areas to be worked on the same job other die sinker rifflers are laid out, i. e., #7, cut 2; #103, cut 2 and #103, cut 4.

TOOLROOM USE OF *Swiss Precision Rifflers*

by J. M. Robert
President
GROBET FILE CO. OF AMERICA, INC.

HENRY FORD IS reputed to have had a standard test for job-hunting toolmakers. He gave each applicant a piece of steel, a few files (no other tools) and set him to work filing out a perfect cube. The story may be untrue, but it does at least point up the fact that hand filing is an art in which first class tool, die, and mold makers must have great proficiency.

It is also interesting in this era of automation to note that while the filing operation on the production line has yielded considerably to modern technology, precision files **in the toolroom** have taken on an increasing importance. Their use constantly broadens due to the higher degree of accuracy and closer tolerances now required in building the tooling for automatic production.

Again, improved technology involves new alloys which are harder to machine. These demand precision files of chrome alloy where in the old days tool steel was more than adequate.

The final finishing and smoothing out of the metal in the various narrow grooves and depressions of tools, dies, molds, jigs and fixtures can best be done with the fine Swiss precision riffler, which is made of chrome alloy steel in a multitude of shapes, sizes and cuts. In some instances, of course, other methods are employed; for example, grinding, honing or lapping. Generally, though, it is safe to say that the riffler in the hands of a skilled craftsman will finish off notches and depressions on complicated pieces more efficiently. One reason is that rifflers do not lose shape through wear as do abrasive tools.

Even some production work such as you may find on intricate die castings or metal stampings requires the fine touch that apparently only the precision riffler can give. In fact it was only slightly over a decade ago that the lost wax metal casting process gave an addi-

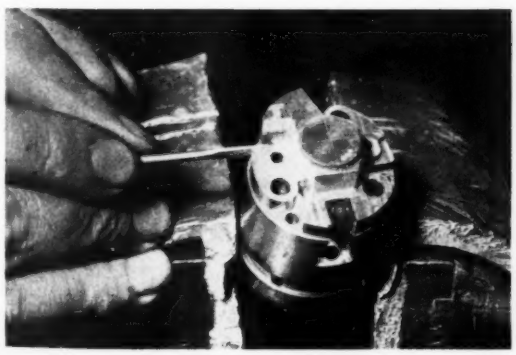


Fig. 2. A #153 riffler is just right to reach into this spot. Filing of this kind depends mainly on "feel"; thus the diemaker must be highly skilled and equipped with the right riffler to avoid costly reworking.

Fig. 3. Here is how they get at finishing a radius with a #102 buttonhook die sinker riffler, cut 4. The work is the cavity for a compression mold. A careful, gentle circular motion removes the precise amount of metal, giving high finish at the time.

tional impetus to their use on the production line.

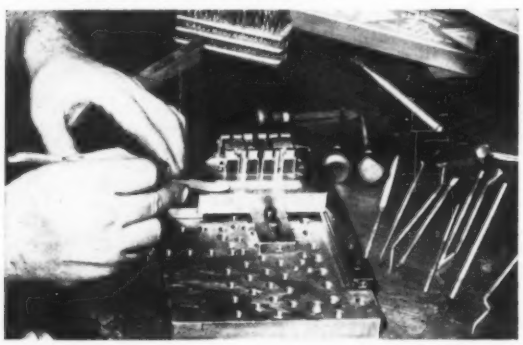
These new casting methods, now coming into their own for aircraft, automotive and other parts, require molds of heretofore unknown precision. To finish off the production pieces resulting from these processes, riffler shapes in wide variety are needed.

The riffler comes by its name from the German "Riefeln," which means to chamfer, channel, flute or groove. The French call it "Rifloir" and the Swiss have brought it to its highest development.

F. L. Grobet, who founded the Grobet File Company in Vallorbe, Switzerland way back in 1812, showed a skeleton line of commercial "Rifloirs" in an early catalog, along with the other types and cuts of Swiss precision files now generally accepted as standard.

Grobet was an enterprising toolmaker who did more than found his own company. He put the making of files on a production basis, each one uniform with the next, and thus established an industry. Until he arrived on the scene files were hand cut by the craftsmen who actually used them.

Fig. 4. A #7 silversmith's riffler, cut 3, is just the thing for the large radius on the mold shown here. This indicates how rifflers made to the special requirements of one industry are often utilized in another. The diemaker has determined the filing operations that will confront him in working this entire job, and has laid out the assortment of Swiss rifflers and files he expects to use on it.



The manufacture of precision files has changed drastically since the time of the first Grobet. Nowadays in the Grobet laboratories, for example, chemists and metallurgists conduct continuing research on alloys and heat treating processes. And special high speed precision machinery produce files far superior to those that were made by hand. Nevertheless, there are still certain operations in file making which require the practiced hand and eye of the Swiss craftsman.

Swiss precision rifflers alone, as we know them today, are available in over 600 variations. There are die sinkers', diemakers' and silversmiths' rifflers. Others are designed for wood patternmaking or cabinet work. The "business" ends may be shaped like buttonhooks or trowels, may have gentle or sharp curves with needle or even bayonet points. Many are extremely narrow and delicate; others are reasonably heavy. Each have different profiles and contours. They range in length from six to eight inches, with cuts of from 0 to 6.

As a matter of fact, nomenclature on these products is highly misleading. "Silversmiths'" riffllers were so called when in the early days silversmiths hand forged their pieces and required certain riffler shapes for their trade. By the same token, die sinkers' and diemakers' rifflers got their names from those hand craftsmen they were originally designed for, more than 100 years ago.

Nowadays, though the traditional names persist, you can select rifflers interchangeably without regard to what they are called. Your only concern need be the contour, size and cut. The accompanying pictures illustrate how rifflers are employed under typical conditions. They were taken in a tool and die shop on plastic mold work, but practically the same problems are encountered elsewhere.

How does one know what riffler to use for a specific job when there are so many to choose from? Well, it is advisable to keep a wide selection in the tool crib of the shapes, sizes and cuts which experience indicates may be needed. There can be no hard and fast rule about this because tool and die work is custom work with two jobs seldom alike. Thus logic and experience must suggest what contours and profiles will lend to the work at hand.

Sometimes only a delicate pass with the right riffler is required — an operation which might take just a few seconds. On the other hand, doing the job with makeshifts can be highly expensive in point of time, far beyond the insignificant cost of a worthy assortment of rifflers and other Swiss precision files.

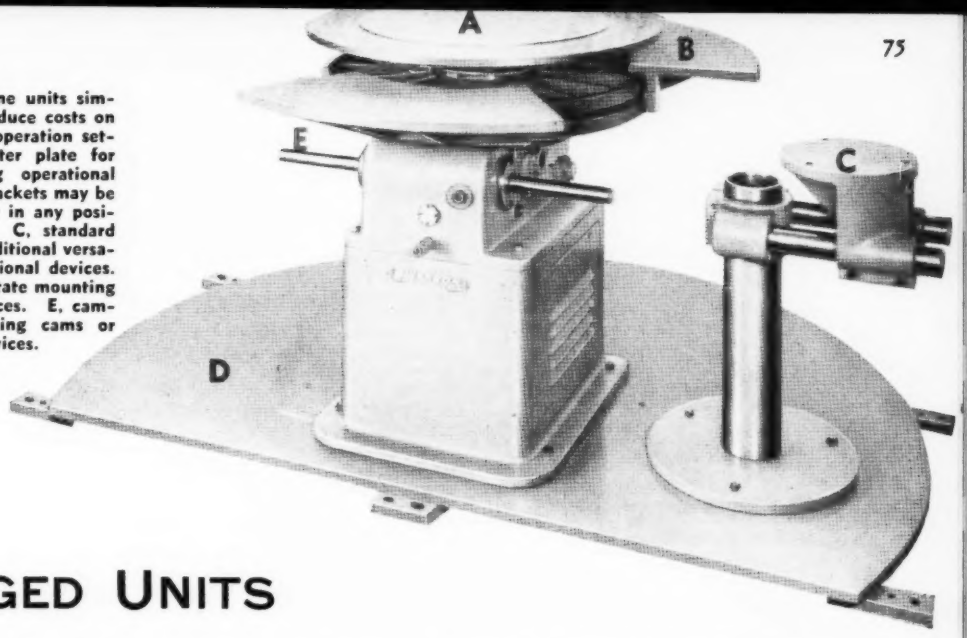


Fig. 1. Standard machine units simplify construction and reduce costs on a wide variety of multi-operation set-ups. A, stationary center plate for mounting or supporting operational devices. B, mounting brackets may be located on radial keyway in any position around the turret. C, standard pedestal units provide additional versatility in mounting operational devices. D, floor base plates facilitate mounting of large operational devices. E, camshaft for mounting timing cams or actuating operational devices.

PACKAGED UNITS REDUCE DESIGN AND CONSTRUCTION COSTS OF AUTOMATION

by Leonard Swanson, President
SWANSON TOOL & MACHINE PRODUCTS, INC.
Erie, Pennsylvania

UNTIL RECENTLY, the major and most publicized contribution to automation has been the special-purpose, transfer-type equipment developed for the automobile industry for performing various machine operations on automobile engine components and similar products. It goes without saying, that this type of equipment represents a substantial investment. Yet, the resulting manufacturing economies more than justify the cost.

With gaining force, competitive conditions and high manufacturing costs are inducing all segments of industry to investigate the possibilities of automatic production equipment . . . with the objective of adopting complete or modified programs for automation involving all types of operations and processes.

However, the demand by industrial management — on production executives, process engineers, and special machine designers and builders — for special purpose machinery to perform a multitude of machining, processing or assembling operations, is often defeated by one or more of the following conditions:

1. A limited capacity in design staff.
2. The prohibitive cost of completely designing and building a special purpose machine for one particular job.
3. Insufficient lead time for designing and building completely special equipment.
4. Inflexibility of a completely special machine that may become obsolete with part change or elimination.

Because of these conditions, we felt there was a genuine need for a basic machine chassis, which could be used in conjunction with other standard attachments and operational devices to facilitate the development of automatic machinery at a minimum of engineering and building cost. Having considerable experience in designing, developing and building special purpose machines for automatically feeding, processing and assembling various products, we invariably utilized a turret type indexing chassis as a basis for such special equipment.

Consolidating the various operational factors involved in our experience with turret type index machines, we succeeded in reducing designs to a standard chassis (Fig. 1) that included the following factors: Optional turret diameters; optional work positions of varying number; optional index speeds varying up to 4700 per hr.; and optional work cycles.

The design adapted also made provision for inside-of-turret mounting of operational devices on a stationary center plate, and provision

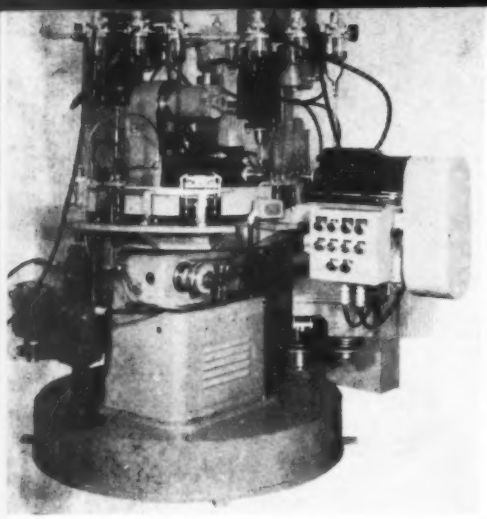


Fig. 2 Special machine built around a standard turret indexing chassis and standard accessories, including standard air-hydraulic units.

for universal mounting of operational devices in any position around the turret periphery by means of standard mounting brackets keyed and bolted to radial clamping ring. Provisions were made for mounting timing or operational cams by means of cam shaft rotating once at each index, and for mounting complete motor and drive unit integrally in base housing.

Universal standard pedestals were provided for either horizontal or vertical adjustment of hoppers, loading devices, etc. Included in the basic design scheme were various standard types of floor bases for mounting turret index units, and related accessories such as hopper pedestals.

By the use of such standard turret indexing units and accessories for applicable special purpose machines, the entire time and cost of designing this fundamental section of any machine is eliminated. Likewise, the shop construction time is saved, and these costs can often be the governing factors in determining the justification for a special machine.

Standard units are available from stock on short delivery . . . which reduces the over-all completion of special equipment to the time factor involved in manufacture of only the special phases of the machine. The basic chassis can be stripped after production is completed on the original job; and, by application of new mounting brackets and operational devices, the unit can be used for a second or third job.

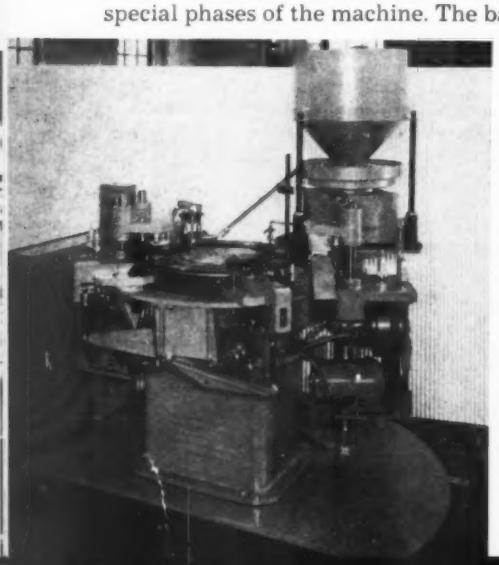


Fig. 3. Standard turret indexing chassis is flexible. As tooled up here, full visibility is provided above the center plate. This facilitates the addition of automatic loading.

Typical applications of standard turret indexing unit chassis are illustrated in Figures 2 and 3. Figure 2 shows a standard 20″ dia., 8-station turret unit with coolant guards removed. This standard unit utilizes standard outboard mounting brackets which support standard air-hydraulic units for drilling, reaming, spot-facing, and tapping holes in both vertical and horizontal planes in a die cast cigarette lighter cap.

It should be noted that in this case, full use of the versatility of the basic chassis is realized by mounting one horizontal counterboring unit on the stationary center plate opposed to a similar unit mounted in line on an outboard mounting bracket. While not clearly shown, a vertical drilling unit, mounted and operated from below the turret face, is also incorporated in this application. Cycles of all operational devices are completely controlled by timing cams mounted on cam shaft as shown, which does not permit the turret to index before all operational devices have completed their cycle.

Figure 3 shows a 20″ dia. standard turret model with 8 stations mounted on a standard base, and with a standard adjustable pedestal for mounting a vibrating hopper and feeding track. Also incorporated are two Swanson standard Power-Di punch press units which have been developed expressly for use on these machines. These precision, self-powered press units perform a piercing and subsequent stenciling operation on the drawn shell involved.

The part is automatically fed to a retainer ring mounted on the turret which progressively presents the stamped part to four different operating stations for piercing, lancing, stenciling, and automatic ejection. In this application, two angular lancing operations are accomplished by devices actuated by confined cams mounted on the cam shaft of the turret indexing unit.

At the start of this article it was pointed out that headline news about automation has usually involved the tremendous labor-saving, transfer-type equipment that represents a large capital expenditure and a correspondingly large reduction in manufacturing costs. We sincerely believe, however, that automatic equipment can be applied in varying degrees to all modern manufacturing operations or processes . . . and that progressive management of small as well as large shops can justify automation projects more readily by utilizing available standard components such as those described here.

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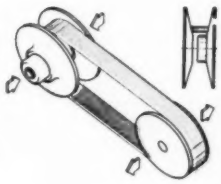

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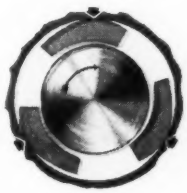

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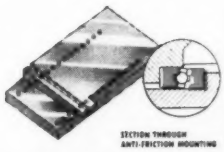

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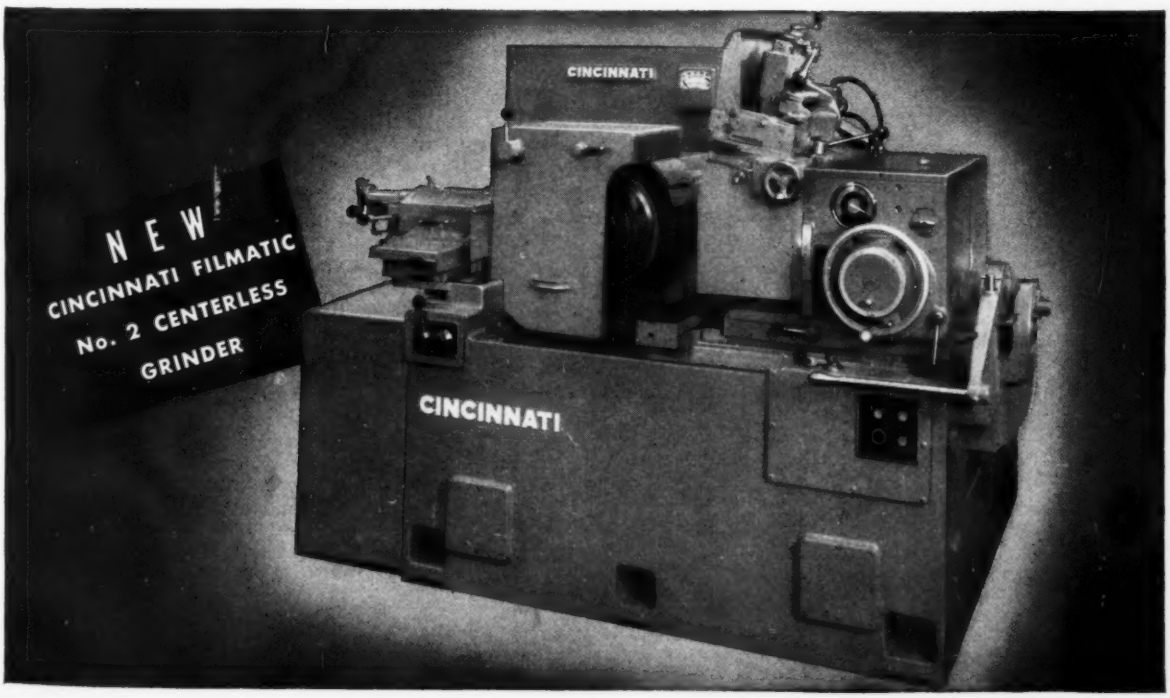

CIRCLE INFORM-A-GRAM KEY NO. 771

23 Important Factors in Designing Trouble-Free Screw Machine Products

THOSE FACTORS which will produce maximum economy when designing and specifying screw machine products are detailed in a report issued by the National Screw Machine Products Association. Designed to aid both design engineers and purchasing agents, the report covers the 23 most important considerations and those most commonly overlooked in ordering of such products.

Factors of design comprise the largest group of recommendations, but, the Association points out, the relative importance of each consideration is not reflected by its sequence in the report. Also, not all are expected to be applicable to all prospective purchasers, although for repetitive buyers of screw machine products, the vast majority of the points listed will apply over a period of time.

Failure to follow those recommendations now given by the Association, has in the past, meant unnecessarily higher costs and often delays in receiving goods. The information contained in the report was obtained by questioning the 280 members of the Association who produce approximately 70% of all screw machine products manufactured by independent concerns.

For convenience sake, the Association breaks down its recommendations in two sections: first to design engineers and production personnel; the second, more specifically to purchasing agents. However, it points out that familiarity with all points listed will promote a better understanding of the basic problems and insure proper cooperation between suppliers and customers.

Design Considerations

1. Design the product so that where possible, standard sizes and shapes of tubes or bars, commonly used in the screw machine process, may be specified. Rounds, squares and hexagons are typical of standard shapes. But there are also other preshaped forms of bar stock, even suitable as semi-formed gear teeth for example, that are available without special order.

2. Avoid unnecessary fancy horizontal shapes in the design of the final product unless absolutely necessary. This also runs up production costs and is not justified unless some utilitarian or ornamental objective is served.

3. Avoid square bottom holes unless absolutely necessary. They are expensive in any manufacturing process.

4. Allow sufficient depth of blind holes to permit clearance of metal chips produced in grinding or thread cutting.

5. Avoid sharp outside corners unless absolutely necessary. They can increase the costs of manufacturing, also are more subject to shipping damage and expense. A bevel edge or countersink is preferable. If it is permissible to remove corners, the limits should be specified.

6. Overly sharp inside corners should also be eliminated unless their importance outweighs added production cost. Frequently a chamfered corner not only saves costs but also increases the product's strength, yet has no functional effect. Also, in some cases, undercutting at the angle point may permit the same function as a square corner, at a lower cost. Usually an undercut has no important effect upon either the strength of the part or the effectiveness of the bearing surfaces.

7. Avoid non-standard threads and special diameter holes. These require special tools and special gages, both items of extra production cost.

8. Avoid excessively close tolerances where possible. These entail extra supervision, more expensive tooling, and frequent tool and machine adjustments. Excessively small tolerances simply represent an unnecessary expense.

9. Don't demand removal of burrs unless essential. Sometimes it is desirable to have outside burrs removed when inside burrs can remain, and vice versa. For some purposes, however, burrs are of no consequence. Also, the removal of tool marks is not always necessary and usually involves additional cost.

10. Don't require that holes be precisely located when they have no definite relation to keyways or other functions. Special jigs and fixtures are necessary when precision is required.

11. When chamfering a corner, a larger chamfer is preferable, to eliminate additional necessary machining. In countersinking, especially a threaded surface, a broad angle is less likely to cause imperfections.

12. If knurls are required, request only an approximate number; this permits a less expensive automatic process. Although it may yield 29 points instead of 30, such a difference is often trivial.

13. Don't specify threads all the way to a shoulder.

14. When a diameter surface is not required to fit another part, it is usually best to specify the diameter in fractions of an inch. Then the part can be made from standard size materials, and the fractional dimension (instead of decimal), will indicate a close tolerance is unnecessary.

15. In specifying materials, choose those with maximum machinability within the range of strength requirements. Excessively hard materials are normally more expensive, increase machining costs.

16. Don't require super-smooth finishes that are unimportant. A hidden part, a part not involving a friction factor, or an exposed part whose appearance is immaterial, may as easily be left rough, at a considerable cost savings. As a natural process sequence, most screw machine products are machined beyond maximum requirements.

17. Be specific about hardness tests if required, also testing of elongation or binding. By nam-

. . . Continued on page 94

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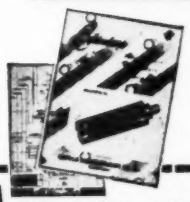

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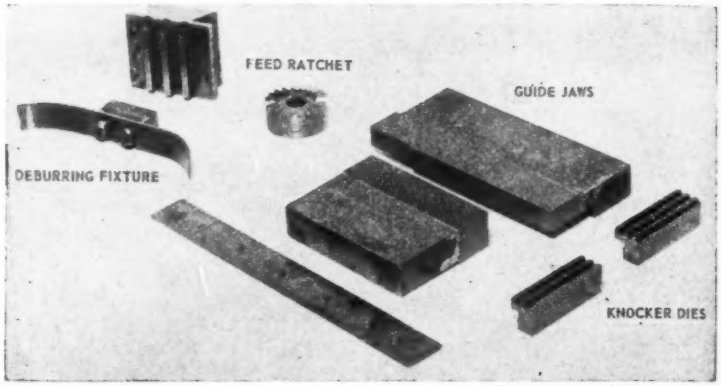
CIRCLE INFORM-A-GRAM KEY NO. 791

CARBIDE

WEAR RESISTANT PARTS REDUCE PRODUCTION COSTS



Photos courtesy Kennametal Inc.

Fig. 1. The carbide wear parts used in the Thompson band saw tooth setting machines are: (1) Deburring fixture—removes burr resulting from the tooth milling operation; (2) Guide jaws—keep saw stock upright for teeth setting knockers; (3) Feed ratchet—indexes on each stroke of the knockers to feed stock into position for setting of teeth; (4) Knocker dies—upset the saw teeth.

BY REPLACING a number of critical steel parts on their band saw tooth setting machines with cemented tungsten carbide wear parts and inserts, the Henry G. Thompson & Son Co., manufacturer of Milford profile, band, and hack saw blades, reduced their maintenance costs to a minimum and obtained uniform product quality in this most important phase of their manufacturing process. Some of the Kennametal wear-resistant parts have been in service now for more than three years and to date show a wear-life ratio of 60 to 1 over their steel counterparts.

Briefly, this band saw setting operation is as follows: Milled stock, to be set, is fed from a drag feeding reel through deburring blades, then between guide jaws and under an indexing feed ratchet. Next, reciprocating dies set the teeth after which the saw stock is collected on a drag coil reel. These carbide wear parts are identified in Figure 1, and are shown in the machine setup in Figure 2.

Deburring Fixture

This consists of a spring-loaded Kennametal Grade K6 plate that bears against the burr-free side of the saw stock forcing it against three vertically-positioned and adjustable carbide scraper blades. As the stock is fed through, these blades remove any burr resulting from the tooth milling operation.

This fixture was put into operation about 2½ years ago and is still in use today. Heretofore, a short piece of special file was used which required frequent downtime for cleaning and replacement. No accurate records have been kept on this operation but estimated saving per machine since installation of the above carbide components is approximately $100.00 per year.

Guide Jaws

These utilize long strips of Grade K6 carbide brazed to adjustable steel bodies, one on each side of the saw stock. Their function is to keep the stock in a fixed upright position for the tooth setting knockers. The initial set of jaws was in use for a little over three years before requiring any regrinding. These savings have been obtained since replacing previously-used hardened tool steel jaws.

	Tool Steel	Kennametal K6
Initial cost (set of two)	$ 40.00	$ 56.00
Grinding cost per year	120.00	
Downtime cost per year for adjustment after regrinding	30.00	
Life of jaws	**1 year**	***48 years (est.)**
Total cost per year	$190.00	$ 1.16
Estimated savings per year with Kennametal		$188.84

* 0.010" stock removal per grind every 3 years.

. . . *Continued on page 208*

THIS NEW 14" *Logan* LATHE PERFORMS . . .

AND THE RESULTS PROVE ITS SUPERIORITY

The more jobs you watch this rugged new Logan "6560" perform, the more impressive it looks. On the heaviest cuts, or at maximum speed, it turns the work *smoothly,* quietly, with precision results. Better performance than you are conditioned to expect of a "good" 14" lathe is literally designed, engineered and built into the "6560".

The Variable Speed Drive provides instant rpm adjustment on work requiring variation of spindle speed. The oversize spindle, with 1⅜" bore, turns on a ball bearing mounting that needs no adjustment within the full range of 38 to 1200 rpm. The bed is a wide, deep special alloy casting, extra heavy and resistant to both internal and external stresses. The two V-ways and two flat ways are precision ground. There is extra strength in the wide gears, heavy bearing supports, massive headstock, carriage and base. This extra weight, plus dynamic balancing of the complete lathe practically eliminates vibration. Remarkably moderate price and low cost operation make the "6560" outstanding in economy as well as in precision performance. See it at your Logan Lathe dealer's, or write for Bulletin 14-L, giving a full description.

SPECIFICATIONS AND FEATURES

14⅝" swing over bed
9" swing over saddle
1⅜" spindle hole
1" collet capacity
40" between centers

Variable Speed Drive
Ball Bearing Spindle
38 to 1200 rpm
Two-V-way, Two-flat way
Precision Ground Bed
Precision Carriage

LOOK TO LOGAN FOR BETTER LATHES AND SHAPERS

LOGAN ENGINEERING CO.
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CIRCLE INFORM-A-GRAM KEY NO. 811

W&B

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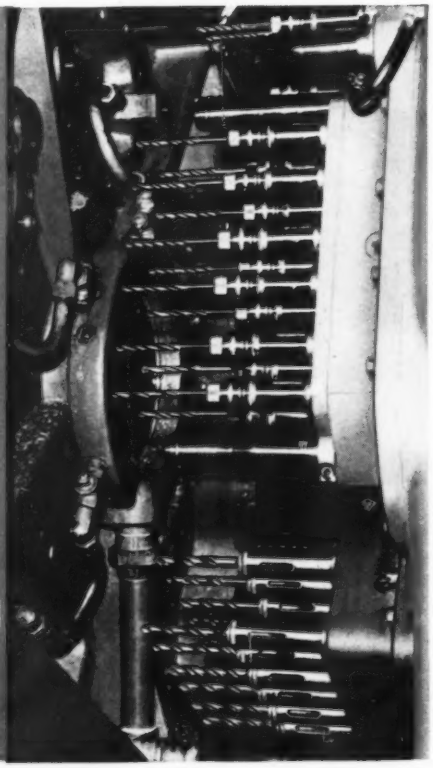

Pictured is the production drilling and reaming of bolt holes in connecting rod caps made from steel forgings. This horizontal multiple spindle machine in one of the largest automobile manufacturing plants in the country, uses 48 Whitman & Barnes drills and reamers in each set-up. In record time the bolt holes are drilled, chamfered, core drilled and reamed.

Throughout this mammoth plant W & B high speed and carbide drills are used on many other operations to secure maximum production, minimum down time for tool replacements and reduced manufacturing costs. If you want better drilling production—the durability and cutting speed of W&B drills are your answer.

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He can save you money by supplying from his stock . . . what you need when you need it!

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CIRCLE INFORM-A-GRAM KEY NO. 821

Tool and Die Manufacturers See Challenge in Automation

The rapidly changing requirements for tool and die making, brought on by the fast strides of automation, preoccupied the thoughts of trustees of the National Tool & Die Manufacturers Association at its recent winter meeting in Los Angeles.

How to obtain the more accurate equipment and how to train a sufficient reservoir of highly skilled manpower necessary for producing the special automation tooling loomed large in their thoughts.

Harold G. Murdock, secretary of the NTDMA and vice-president of Arrowsmith Tool & Die Corporation, of Los Angeles, keynoted the dual problem.

"Automation, which will bring about automatic factories for many industries in the near future," he said, "poses the greatest challenge in the history of our industry. Toolmakers have been in the forefront in bringing about this second industrial revolution, whereby instruments linked up with machines replace many human operations. While these labor-saving devices and processes will reduce production man-hours, they will increase the need for skilled technicians and the facilities to create and maintain them."

Mr. Murdock urged that financial and government leaders familiarize themselves, as never before, with the important role of the contract tool and die industry. "We shop owners need more accurate equipment to meet automation's demands for precision in ten-thousandths and hundred-thousandths of an inch," he said. "Machine tools to produce such accuracies cost two to three times what they cost 10 years ago. As small businessmen we cannot finance the purchase of this equipment in the normal way. In order for industry to draw upon the indispensable creative and technical skills of our shops, a full understanding of this problem and a willingness to take the required steps are necessary."

George S. Eaton, NTDMA executive secretary, appealed to

. . . *Continued on page 86*

How many different 10x10 DANLY DIE SETS

can you order from stock at your nearby DANLY Branch?

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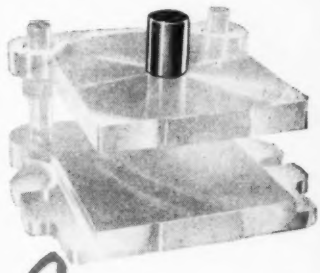
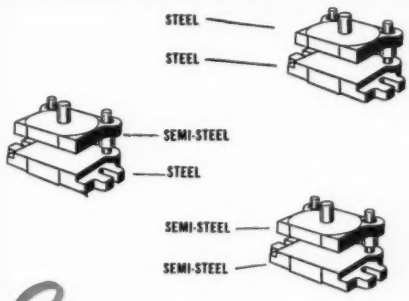


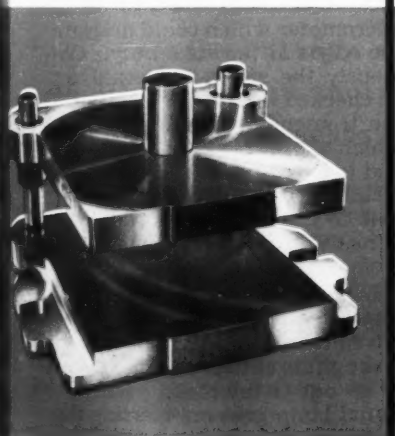
6 shank size variations

4 bushing type variations



3 different material combinations

16 guide post lengths in each of 3 different styles to choose from



Multiply all of these combination possibilities together and you'll discover that there are *31,104* different standard Danly Die Sets in just this *one* size . . . and all are cataloged and *stocked* in the Danly Branch near you. Amazing? Yes, but it serves to illustrate an important point for *your* benefit. The almost unlimited variety of Standard Danly Die Sets *in stock at your Danly Branch* will meet your specific needs exactly . . . and fast. So remember, when you want the best in die sets in the shortest time, the place to call is your local Danly Branch.

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5 West 10th Street
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LOS ANGELES 54
Ducommun Metals & Supply Co.,
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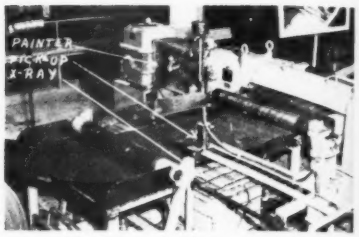
CIRCLE INFORM-A-GRAM KEY NO. 841

Gaging Sheet Steel for Tubing Fabrication

A foolproof method for gaging sheet steel used in the manufacture of GM Steel Tubing has been installed by the Rochester Products Division, General Motors Corporation.

The ingenious device is called an x-ray thickness gage which is attached to a sheet metal slitter.



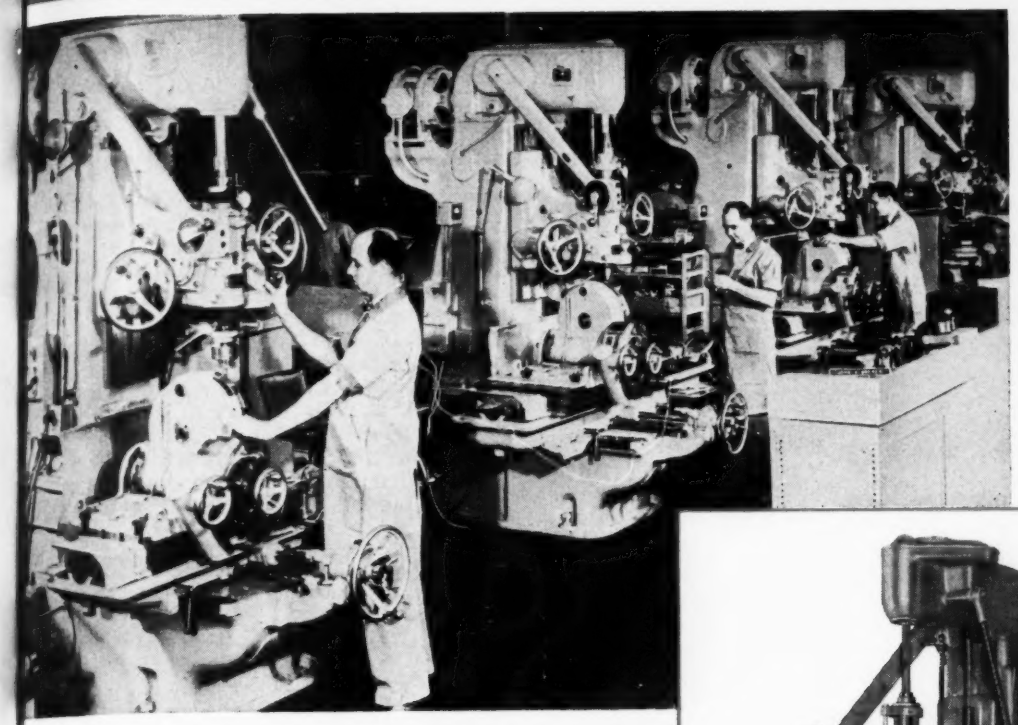
The slitter slices rolls of 36″ sheet steel into as many as 56 separate strips. Currently at Rochester Products, 15 different thicknesses of metal are being used, depending on the wall thickness of the tubing specified.

The x-ray thickness gage consists of a chassis console, an x-ray source and a pickup. The x-ray source is mounted with the pickup and aligned by means of a "C" frame. Sliding the source and the pickup back and forth enables any section of the sheet steel to be gaged.

Before the x-ray thickness gage was put in operation, the sheet steel was checked by a micrometer which could measure the edges of the steel only. Obviously the entire roll could not be checked in this manner due to the tremendous amount of time which would have been involved, and also the old method had the further disadvantage of not being able to measure the middle portions of the sheet steel which occasionally was off size.

Under the new method the steel is run through the slitter at 600 fpm and is continually gaged through its entirety. In the event of an out-of-tolerance portion, a signal lamp goes on, alerting the operator and an air brush containing marker dye paints the faulty section.

Through use of this method savings are being realized in decreased inventory losses, and reduced "downtime" of the brazed and welded tube mills.

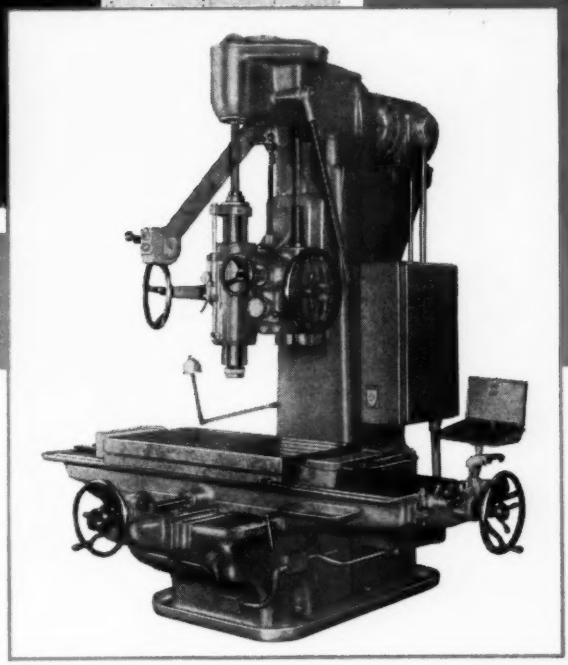


A section of the Woodward Governor Company plant in Rockford, Illinois showing a line of four P&W No. 2A End-Measure Jig Borers equipped with P&W Precision Tilting Rotary Tables.

WOODWARD GOVERNOR COMPANY USES

PRATT & WHITNEY

END-MEASURE JIG BORERS



"... Pratt & Whitney was compared with other machine tools and found best suited to our needs."

Whether used for toolroom work or limited-run production, you'll find extreme accuracy, fast easy operation, dependability and low maintenance cost in P&W End-Measure Jig Borers.

The fundamentally correct P&W End-Measure System—basis for all others—uses precision end measures to obtain even inches and inside micrometers for inch fractions accurate to .0001"; every mechanic knows these instruments thoroughly. Built in "zero point" indicators provide a constant visual assurance of tenths accuracy.

The exclusive P&W Ball Roll Quill "roll feeds" on super-precision balls with a total pre-loaded bearing pressure of over 6000 pounds. This construction resists heavy lateral loads and retains initial high accuracy indefinitely without maintenance.

THE No. 2A —practical size for most shops; table 22" x 44"

also THE No. 1 1/2B —compact and versatile; table 12" x 24"

THE No. 3B —large, powerful; table 24" x 54"

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...with quickly interchangeable extensions and gaging contacts.

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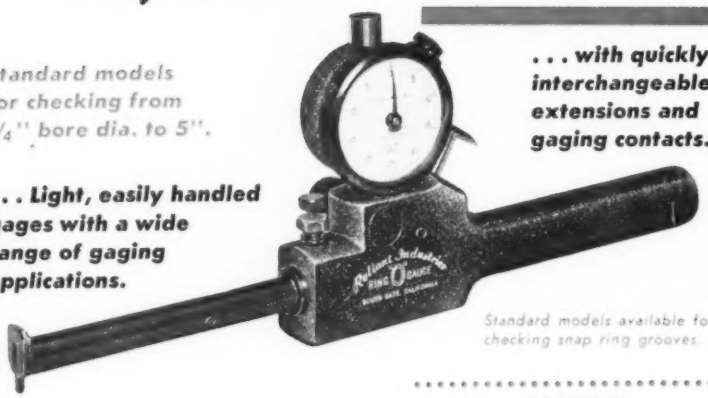
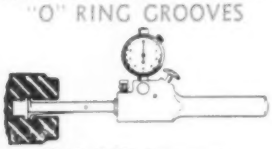


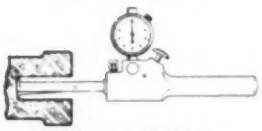
Standard models available for checking snap ring grooves.

"O" RING GROOVES



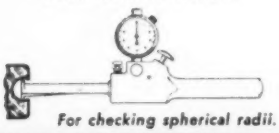
Checks "O" ring grooves.

BLIND HOLES



Checking a blind hole.

SPHERICAL RADII



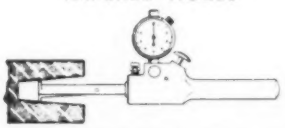
For checking spherical radii.

Write for catalog

RECESSES

Gaging recess in blind hole.

TAPERED HOLES



Gages taper or bell mouth.

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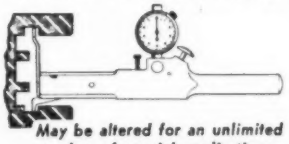

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PRECISION GAGING EQUIPMENT

CIRCLE INFORM-A-GRAM KEY NO. 861

. . . Automation, from page 82

shop owners to step up the training of apprentices "in view of the growing complexity and precision of industrial processes."

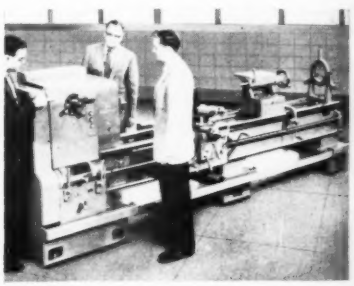
"While the recent slowing down in tool and die business tends to obscure the shortage of skilled men," he said, "a serious shortage does exist — and will grow more critical unless more apprentices are trained."

Concluding their three-day meeting, the NTDMA trustees voted to ask the House of Representatives to include the deferment of apprentices and journeymen toolmakers during an emergency in the new military training bill HR 2967 under consideration by Congress.

Two Tray-Top Toolroom Lathes

Two new all-geared head "Tray-Top" lathes, swinging 21½" and 26", with 12 spindle speeds and a 3-lever, color match, direct-reading shift mechanism, are announced by Cincinnati Lathe & Tool Co.

The spindle, with long taper key drive nose, is rigidly mounted in three zero precision anti-

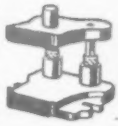


friction bearings; all headstock bearings, gears, and shafts are pressure lubricated with filtered oil; and 54 thread and feed changes are available through a totally enclosed, automatically lubricated quick change gear box, where a lever to reverse the lead-screw is also incorporated.

The apron is a one-piece, double-walled casting with automatic lubrication. Longitudinal and cross feeds are engaged with drop levers operating positive jaw clutches, and a spindle start-stop control lever is supplied at the apron and quick change box.

Complete information is contained in a catalog from Cincinnati Lathe & Tool Co., Cincinnati 9, Ohio, or — **Circle No. D1.**

now LEMPCO

2-POST *BALL BEARING*  DIE SETS

ARE PRICED DOLLAR-FOR-DOLLAR WITH COMMERCIAL PLAIN BUSHING DIE SETS!

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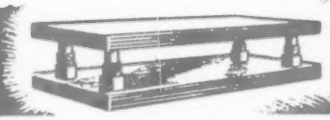
LARGE & SPECIAL  LEMPCO BALL BEARING DIE SETS *NOW* QUOTED AT DRASTICALLY ***REDUCED PRICES!***

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MAN-MADE DIAMONDS CLIMAX LONG SEARCH BY SCIENTISTS

Tiny diamonds have been successfully made from a carbonaceous material subjected to extreme pressures and temperatures, it was recently announced

by the General Electric Research Laboratory. Duplicating Nature's own diamonds, the crystals made by G-E scientists will scratch other diamonds.

While not of "gem quality" in size, color, and crystal perfection, the G-E diamonds may some day be of vital importance to Industry for use in grinding wheels, dressers, laps, and other tools.

Although the processes developed have been repeated successfully more than 100 times, the high costs of producing these diamonds are readily admitted to by the Laboratory officials. They are hopeful, however, of being able to reduce such costs to where commercial production will be possible.

Actually, several processes have been employed with success, but of varying degrees. The one producing the largest crystals involves subjecting a carbonaceous compound to a measured pressure some 53,500 times greater than atmospheric (close to 800,000 psi) using a 1000-ton press. Processes have been cross-checked by independent teams of scientists, in each case with success.

The G-E diamonds pass all tests developed for natural diamonds, including hardness, carbon content, X-ray diffraction.

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Extra precision, extra sturdiness and low cost mean EXTRA VALUE.

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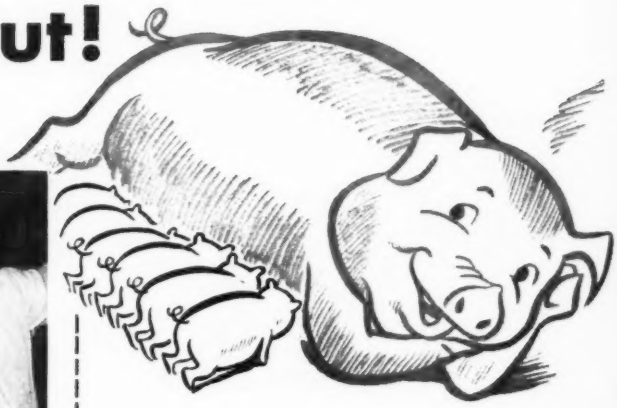
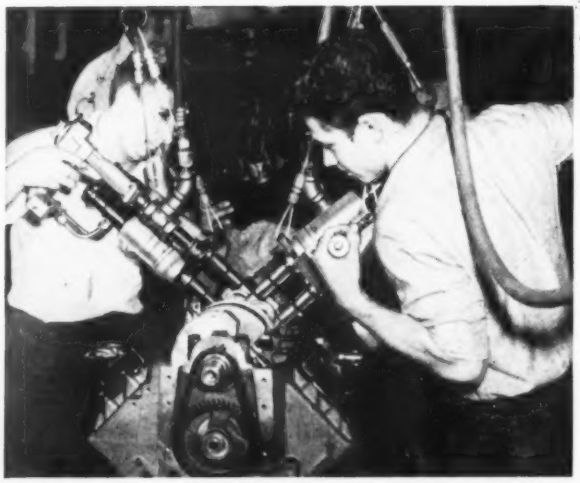
Multiple Spindles provide Greater Output!





2-Spindle Multiples tighten connecting rod bolts on the assembly line.

A 6-spindle Multiple Nut Setter assembles automobile crankshaft to flywheel.

The new Keller Multiple Nut Setters improve quality control and reduce production costs. Manufacturers have been quick to make use of their advantages:

1. Built-in torque regulation in each individual spindle, giving control of torque on each bolt. Torque is adjustable from 4 to 190 ft/lb.
2. Torque held within close tolerances—comparable to that obtainable with accurate hand tools.
3. Increased production and lower production costs.
4. Easily adaptable to changing needs . . . a change in bolt spacing merely requires a new mounting plate for the spindles . . . when a job is completed the spindles are completely salvageable for use in another Multiple.

Do you have applications where bolts or nuts can be run and tightened two or more at a time? If so, it will pay you to investigate this remarkable tool. Write for Bulletin 16-101.

GARDNER-DENVER Since 1859 K KELLER TOOLS

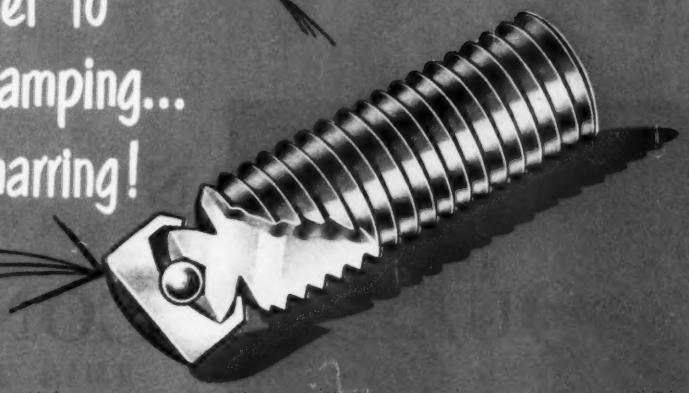
KELLER TOOL 1313 FULTON ST.

DIVISION OF **GARDNER-DENVER**

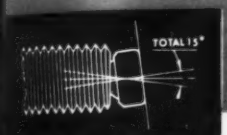
GRAND HAVEN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 901

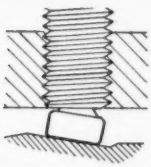
Here's the secret to positive clamping... freedom from marring!



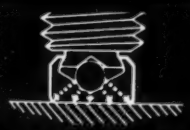
the New Vlier SCREW-BALL CLAMPS!



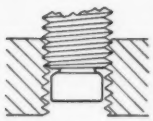
Ball-bearing construction insures frictionless, automatic angle adjustment and rotation; pad swivels freely in all directions up to 7½° from the centerline!



Pad seats firmly on work surface within angular range!



Force distributed equally to pad face. Conical seat distributes force equally in all directions; insures easy alignment in angular applications; greater freedom of motion.



Pad inserts from top of threaded hole or from bottom for easy installation!

Large pad area. Pad is machined from the solid, not counterbored or relieved; has greater strength plus freedom from distortion!

NO MORE EXPENSIVE, CUSTOM-MADE SWIVEL PADS . . . 17 size variations; ¼" O.D. up. N.C. threads; class 2 fit.

LOW COST...Saves hundreds of dollars annually in toolmaker's time!

NO MARRING...Rotation of pad ceases at first touch against the work! Soft seat saves surfaces!

HEX SOCKET HEAD...for easy hex key adjustments!

HACK AS THE ACE OF SPADES! Completely rust proofed end to end!

KEEP VLIER SCREW-BALLS IN STOCK FOR INSTANT USE—SAVE YOUR TOOLMAKER'S TIME!

Ask your Vlier Distributor for an assortment of sizes today!

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[illegible] HOLLYWOOD LOS ANGELES 46, CALIFORNIA

MONEY-SAVING TOOLING SPECIALTIES FOR EVERY REQUIREMENT!

TORQUE THUMB SCREWS— Apply accurate, controlled end pressures; eliminate distortion to the workpiece. 4 models; 19 sizes!

VLIER SPRING PLUNGERS— For use wherever accurate, positive spring loads are needed! 4 models; 40 sizes!

VLIER SPRING STOPS— Provide end pressures in fixtures when wall sections are not available. Two models: 14 and 32 lbs. end pressure.

VLIER TOGGLE PADS— Assure solid clamping of parts with uneven or off-angle surfaces. 5 sizes; fit almost any clamp.

VLIER FIXTURE KEYS— New 5-Way Key fits every standard mill table slot. 3-Way model also available.

Write for your complete catalog of Vlier products today! It's free!

The May Issue

8th ANNUAL

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ISSUE

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by

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Use Inform-A-Gram following page 166 for your service requests and comments.
1954 "Q.C." issue brought us 10,660 such requests.

We'll be hearing from you.

TOOLING and PRODUCTION
The Magazine of Manufacturing Management

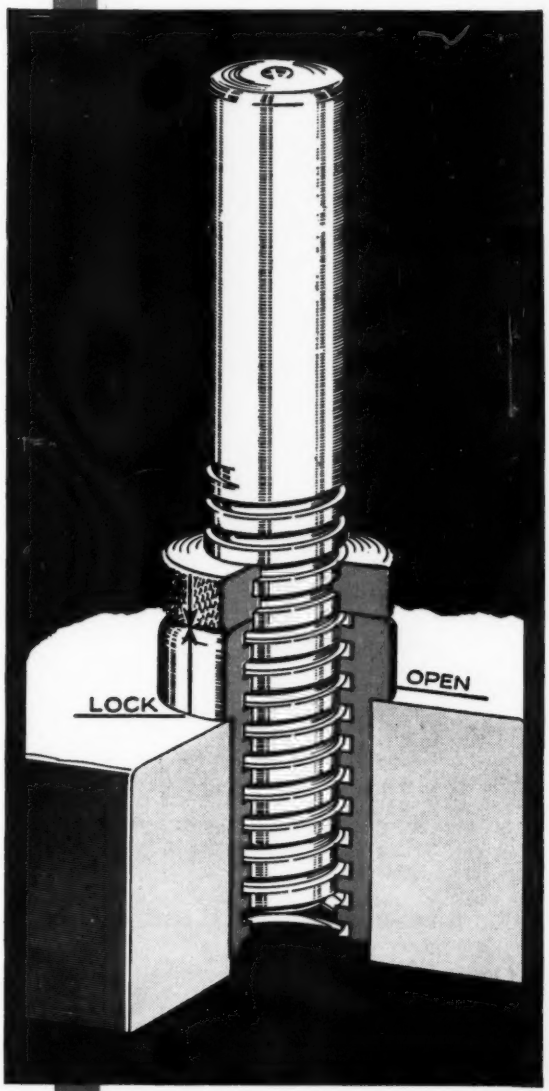
NEW...

SUPERIOR SPIRA-LOCK

REMOVABLE GUIDE PINS

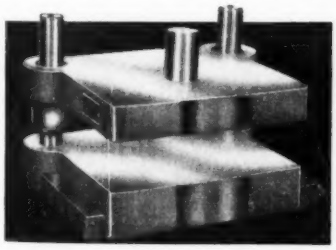
permit shut height adjustment to die — give maximum rigidity — accuracy

The new Superior Spira-Lock Removable Pin provides easy adjustment to the shut height of the die and equal press from top to bottom of bushing. Exclusive threaded arrangement of pin and bushing permits screwing of pin to desired shut height. Thread of pin is then press fit into thread of bushing, providing maximum rigidity. Removal of pin is equally easy and rapid.



CHECK THESE TIME AND MONEY SAVING FEATURES:

- ★ Both pins and bushings hardened for long wear and rigidity.
- ★ Pins removable in press without turning die shoe over.
- ★ Lock Nut on bushing assures retention of desired shut height and full press fit.
- ★ No special tools needed for installation or removal.
- ★ Cutting or grinding of pins eliminated.



Only SUPERIOR Precision — All Steel DIE SETS Give You SAFER, FASTER, EASIER HANDLING

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Boston, Mass.—HUbbard 2-3373

CIRCLE INFORM-A-GRAM KEY NO. 931

. . . Screw Machine, from page 78

ing the testing method and the physical properties desired, it's possible to avoid costly confusion.

18. If the buyer is to heat treat or plate, dimensions should be given prior to finishing. If the supplier however, will heat treat or plate, dimensions should be shown after heat treating or plating. Plating thickness should also be given. In addition, special pitch diameters before plating require special gages and are costly. For plating threaded parts, specify unified thread standards to take advantage of standard gages which will allow for addition of plate.

19. Avoid concentricity where possible. Where it is essential to proper function however, it should be shown in terms of total deal indicator reading, and the point of measurement clearly shown on the blueprint.

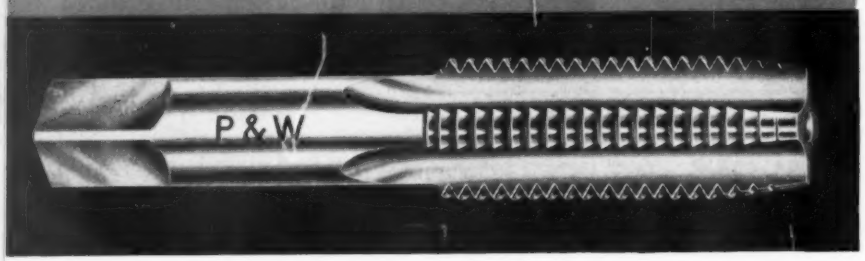
20. Avoid unnecessary second operations since they are normally more expensive than automatic screw machine operations. Often, the redesigning of a product eliminates a second process by combining it with the original machine operation.

Considerations For Specifying

21. Because producers of screw machine products generally work from fixed quantities of raw materials, there is often a price advantage for the purchaser of the final product if he allows elasticity in his order size. This is due to the fact that variations in the length of bar stock as obtained from the mills, and variations in scrapped quantities during manufacture, may cause actual output slightly over or under the estimated total. Thus, the customer, by agreeing to accept 10% more or less than the quantity ordered, can benefit, so state ordered quantity accordingly.

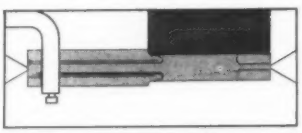
22. Another major potential item in cost-saving is the elimination of orders in very small quantities. Machine setup, tools, and other overhead naturally average higher per product unit when apportioned to a short run. Thus, if the parts ordered are standard, it is wise to order as large a quantity as possible; often, the inventory increase is not as great as the extra cost of the smaller quantity.

TAPS
Always Concentric
Always Accurate



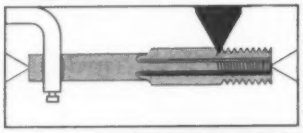
because.. All Important Operations on Pratt & Whitney Ground Thread Taps ARE PERFORMED ON CENTERS!

SHANKS GROUND on CENTERS



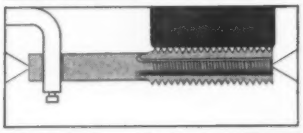
Shanks are precision ground, *on centers*, as the first step in insuring concentricity between the chuck and the threads on the tap itself.

THREADS GROUND on CENTERS



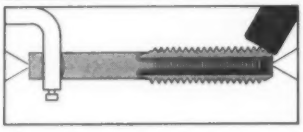
Threads are precision ground, *on centers*, to insure a uniformly perfect thread form, the basis of clean, accurate threads in the finished work.

O.D.'S GROUND on CENTERS



Outside diameters are precision ground, *on centers*, another step in maintaining necessary concentricity between shank, pitch diameter and crests of the thread.

CHAMFERS GROUND on CENTERS



Chamfers are ground, *on centers*, thereby guaranteeing equal distribution of the chip load per tooth, on each land of the tap, as well as close control of tapped hole size.

YOU GET MORE for Your Money from P&W Taps

For complete information on Pratt & Whitney Taps, write on your Company letterhead to the Branch Office nearest you — or direct to West Hartford.

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23. A sufficient allowance should be made for deliveries. It may be necessary to design, order, and make new tools, and time may be required to obtain materials and set up machines. Consideration should be given to the fact too, that machines are not always immediately available. As in any business, rush orders are more expensive to fill. There is usually a price advantage to placing orders that permit a back-log and stable operations.

"Face Facts"

"You are more likely to make a sound decision when you have the facts staring you in the face", was the conclusion reached by a manufacturer after his experience with the Produc-Trol System. This system is a simple, visual device which shows at all

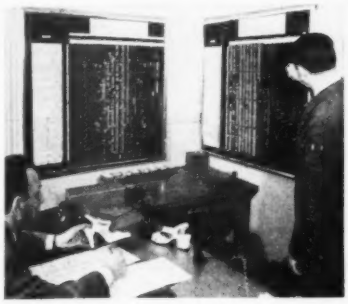

Photo courtesy Wassell Organization, Inc.

times what is going right and what is going wrong. It is so flexible in operation that it can solve any control problem regardless of company size, type of business, or departmental requirements.

The system incorporates a board which provides for columnar divisions representing the various operations through which an order may be scheduled.

The right side shows the date or time section of the board. This section is provided with rows of 200 holes extending horizontally across the board.

A large round peg called a "Location Peg" is placed in the column representing the scheduled completion date. A "Progress Tape Peg", with a tape attached, is placed in a hole representing the progress of the operation. It is moved from day to day as work progresses. Thus it can always be seen how the work is progressing. If the work is behind schedule, take corrective action.

THE NEXT GROUND THREAD TAP YOU BUY will be made to the NEW INDUSTRY STANDARDS

BULLETIN No. T-583

SEND FOR THIS Free Booklet

GET ALL THE FACTS AND NEW TAP LISTINGS YOU'LL NEED FOR AN EASY AND ECONOMICAL TRANSITION FROM THE OLD STANDARDS WITHOUT OBSOLETING YOUR EXISTING INVENTORY OF GROUND THREAD TAPS

Write on your company letterhead . . . or use the coupon below.

Effective February 1, 1955, ***all ground thread taps*** for American and Unified Screw Threads are being manufactured in accordance with the NEW REVISED STANDARDS! While the changes affect nomenclature and, in certain ranges pitch diameters, the revised standards generally meet the requirements of all Industry and the Federal Services, and are designed to provide a wider selection of accurate ground thread taps to secure the Classes of Thread Tolerance desired with maximum wear life.

SINCE 1860 First Choice for Accuracy

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Please send my free copy of the P&W Bulletin No. T-583 that fully describes the New Ground Thread Tap Standards.

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*All are Genuine Tool Steels

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Widest Range Of Applications Including forming, drawing, sizing, flanging, embossing, and combination dies, work support blades, forming rolls, steel mill straightening rolls, machine parts, plug, thread and ring gauges, cams, bushings, sleeves, mandrels, fixtures and other applications.

NOW MILNE has the answer to a diemaker's dream!

- **MINIMIZES MACHINING**
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JIC-06 . . . Oil Hardening, Non-Deforming . . . Full Length Kolorkoted Pink and Gray for Permanent Identification

This new combination of Timken Graphitic Steel features in Hollow Die (Tubular Tool) form is Milne's latest bee-line to better, lower-cost tooling.

Has a double advantage over standard oil hardening tool steels.

1. Free graphite makes it the fastest, easiest machining tool steel in tubular form and insures non-seizing properties.
2. Diamond-hard carbide particles guarantee super wear resistance.

Rough turned O.D. and I.D. Saw cut faces. Furnace annealed – no scale. Cut to any length.

Stocks of a range of sizes being built to meet demand. Write for a stock list and Milne's new Hollow Die Catalog section.

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How to Machine Hevimet Alloy

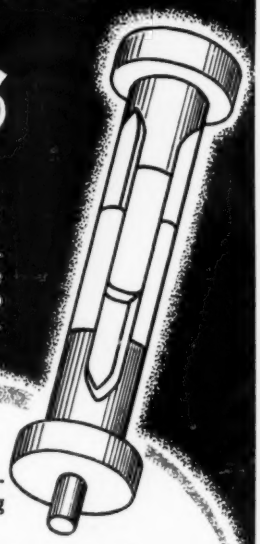
Contrary to many opinions, Hevimet — the high density, high tensile strength alloy of tungsten, nickel and copper—can be readily machined, drilled and ground, according to engineers of Carboloy Department of General Electric Company, Detroit.

Hevimet is used extensively as a weight and vibration dampener, and in radio-active shielding. It is approximately 1.5 times as heavy as lead. Its machining characteristics are similar to those of cast iron, and the same precautions against break-outs are taken with Hevimet as with cast iron, Carboloy engineers report. They point out that machining techniques include lower feeds and greater side or peripheral cutting edge angles. In drilling, however, a sharper cone angle can be employed. The metal has a machinability rating of about 75%.

1. Turning, Boring, and Facing
   Use cemented carbide tools — grade 883 (or 44A)
   Tool geometry:
   0° back rake
   6° side rake
   7° end clearance
   7° side clearance
   8° end cutting edge angle
   15° side cutting edge angle
   Coolant: dry
   Feed: 0.004-0.008 ipr, finishing
   0.008-0.016 ipr, roughing
   Speed: 300 sfpm, finishing
   170 sfpm, roughing
   Depth of Cut: 0.050-0.250"
2. Milling and Shaping
   Use cemented carbide tools — grade 44A (or 883)
   Tool geometry:
   10° axial rake
   10° neg. radial rake
   7° face relief
   7° peripheral relief
   6° face cutting edge angle
   45° peripheral cutting edge angle
   Coolant: dry
   Feed: 0.004" per tooth, finishing
   0.008" per tooth, roughing
   Speed: 250 sfpm, finishing
   150 sfpm, roughing
3. Grinding
   Use medium-hard aluminum oxide grit, with medium grain and spacing and a vitrified bond.
   Use conventional grinding practices.
4. Drilling
   Use cemented carbide grade 883, or high speed steel
   Coolant: sulphurized oil or dry
   Feed: 0.010 ipr for h.s.s.
   0.005 ipr for 883
   Speed: 50 sfpm for h.s.s
   300 sfpm for 883
5. Reaming
   Use cemented carbide grade 883
   Coolant: sulphurized oil or dry
6. Tapping
   Use high speed steel
   Coolant: sulphurized oil
   Speed: 60 sfpm

For over 15 years
Durable Patented
PUNCHES
(with inter-mesh sleeves)
HAVE SOLVED PRODUCTION PROBLEMS NOT POSSIBLE WITH ORDINARY PUNCHES!

The Durable Patent Punch is mounted into 2 inter-meshed sleeves which give 100% support. So the Punch CANNOT buckle. This permits perforation into metal many times thicker than diameter of hole.



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1. LONGER LIFE: Punches vertically lapped and electro-coated. Makes for easier stripping—retards fireing or galling—gives longer life.
2. POSITIVE ALIGNMENT: Punch is completely confined and can't shift off center.
3. ELIMINATES DRILLING HOLES: Where hole diameter is less than metal thickness, Durable Punches will EASILY perforate up to triple usual metal thickness.
4. PUNCHES HOLES THRU RODS: Perforation easily accomplished with Durable principle.
5. EASY PUNCH CHANGEOVER: No pressing in or out—punch slips into mounting sleeves—quick as a wink.

DEPEND ON DURABLE TO SOLVE YOUR PUNCH PROBLEMS

We invite questions—without obligation. Write today—present your problem and we'll gladly acquaint you with facts derived from years of experience.

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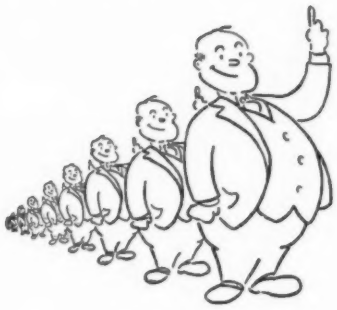
CIRCLE INFORM-A-GRAM KEY NO. 971

TRACER CONTROLLED MACHINING AS APPLIED TO VERTICAL BORING MILLS



Mr. Duplicator

MR. DUPLICATOR SAYS — "Walker, there are batteries of Vertical Boring Mills all over the country turning and boring odd shapes that are just a nightmare for their operators. Can you do anything about this with your Duplicators?

WALKER SAYS — "Yes, we do know there are huge gangs of boring mills such as: Bullards, Niles, and Kings, doing real mean jobs. But we do have plenty of our Duplicators on these mills and we are putting in more all the time. This is attested to by the photograph that shows our Duplicator of two dimensional design that will turn or bore anything that you can put into a template or put a tool into."

WALKER Two Dimensional Duplicator controlling two heads in the turning of railroad car wheels.

WALKER DUPLICATORS have been installed on the largest of Vertical Bore Mills and the smallest. One company gave us an order for 28 Duplicators of two dimensional design. This means boring mills for as far as you can see. Another company equipped 2 machines that had two heads on the rail and equipped both with two dimensional Duplicators. We are unlike some people in design. We believe in simplicity. Wo do not need: relays, switches, fluid motors, check valves, accumulators, nor solenoids. A development in our tracer controlled valves automatically controls the flow of oil to hydraulic cylinders that operate without any noticeable reverses. This can only be done in duplicating with a hydraulic cylinder. Accuracy is unbelievable.

ON THIS TYPE machine we move the template—tracer is always under the finger tips of the operator if he wishes to check. No matter how big the machine is the tracer is always accessible. No need for a ladder to be used. This design tends to a greater feeling of security and operator's well-being.

ALL THE ABOVE mentioned boring mills are built of rugged and accurate design. We help along by building a Duplicator that is also rugged in design and will take a cut in as great a proportion as the tool itself and the machine will stand. There is no need to baby a job when you have a WALKER DUPLICATOR operating it. We not only build Duplicators for vertical mills but for horizontal mills of the largest and smallest of sizes. Also we build Duplicators for lathes, planers, shapers, grinders, and special machines. Our Duplicators are put on many machine tools as standard equipment and can be put on the old machines as well as the new machines in your shop. Let us help you! Write or call us today! Phone: Standish 7871.

REPRESENTATIVES IN PRINCIPAL INDUSTRIAL AREAS

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Pioneer Designers and Builders of Precision Duplicating Equipment

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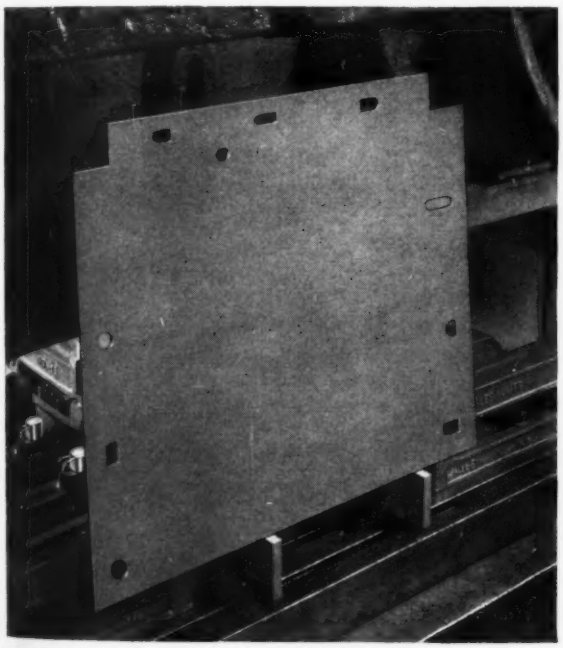
Production....

.....'way out ahead

WALES HOLE PUNCHING & NOTCHING EQUIPMENT



TOP — Wales Type "BL" Hole Punching Units and Wales Type "N" Notching Units in a combination staggered hole punching and notching set-up in a press brake.

BOTTOM — Typical round and shaped holes plus corner notches produced by Wales Type "BL" Hole Punching Units and Type "N" Notching Units in a stamping press.

By providing simpler, faster set-up methods, Wales Hole Punching and Notching Units *insure greater production economies.*

For example, a group of these independent, self-contained Wales Units may be set up for punching and notching to produce parts the same day a pattern is released for production. These "Right-Into-Production" advantages are made possible by proven Wales features:

- Nothing attached to press ram
- Punches and dies always in perfect alignment
- No die set required
- Independent and self-contained
- Set up in press brakes and stamping presses on templates, T-slotted plates or press brake rails
- Uniform shut height requires only one ram adjustment
- Units may be used in unlimited set-ups eliminating "dead storage"

Before putting holes and notches in angles, channels, extrusions and sheets by *any* method, have the Wales facts at your finger tips. Write today for your personal copy of Wales BL catalog.

WALES-STRIPPIT CORPORATION

George F. Wales, Chairman

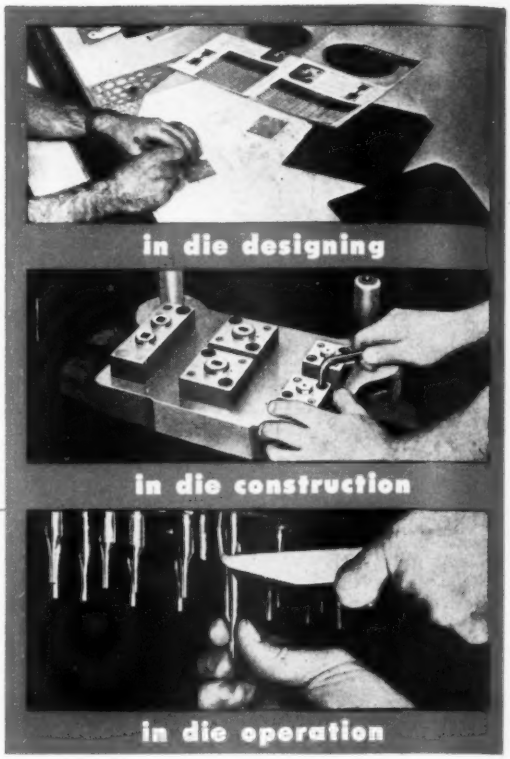
355 Payne Avenue, North Tonawanda, N. Y.

(Between Buffalo and Niagara Falls)

Wales-Strippit of Canada, Ltd., Hamilton, Ontario

Specialists in Punching and Notching Equipment

WHERE R-B Punches cut your costs



IN DIE DESIGNING

. . . you save "board time" by working with the standardized R-B concept of punches, die buttons, punch retainers and die button retainers. R-B standardized equipment reduces drafting time to cut your costs.

IN DIE CONSTRUCTION

. . . you save "building time" because R-B punches, die buttons, punch retainers and die button retainers are furnished completely finished. R-B saves skilled die-maker's time to cut your costs.

IN DIE OPERATION

. . . you save "press time" because R-B punches and die buttons are instantly removed and replacements quickly inserted. Inherent accurate alignment and positive locking keep press down-time at a minimum to cut your costs.

Use R-B Engineering Service for Your Tough Piercing Problems.

RICHARD BROTHERS PUNCH DIVISION
ALLIED PRODUCTS CORPORATION
DEPT. 77 • 12635 BURT RD. • DETROIT 23, MICHIGAN
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COMPANY _____

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Also Produced in
OTHER ALLIED PLANTS
SPECIAL COLD FORGED PARTS
STANDARD CAP SCREWS
PRECISION GROUND PARTS
SHEET METAL DIES MADE OF FERROUS ALLOYS, ZINC ALLOYS OR PLASTICS

CIRCLE INFORM-A-GRAM KEY NO. 1001

JIG BORING ON SMALL DIES, JIGS, AND FIXTURES

Opportunities for handling a wide variety of small die work, jig and fixture making, drilling, reaming, and precision boring are found in the Linley jig boring machine.

Compact in design, simple in operation and setup, yet a precision tool for the types of work that confront busy tool rooms, it has been found valuable in releasing the larger machines for work better suited to their capacities.

This jig borer has been made more versatile by the addition of a new power quill feed. The quill is driven by a small belt running from the spindle, with one speed, co-ordinated with the spindle speeds to feed slightly more than .001" per revolution of the spindle.

Feed is downward only with an automatic trip adjustable to trip in any location of the quill travel.

Also, something new in end measuring rod equipment has been added, which consists of 2 troughs, 2 permanently mounted one-inch micrometer heads, 2 indicators calibrated in tenths, 9 end measuring rods calibrated in even inches from 1" to 9" inclusive, and the necessary adjusting brackets with adjusting screws.

In making setups with this measuring equipment, it is designed so that computing is reduced to a minimum, because it is only necessary to work with whole numbers.

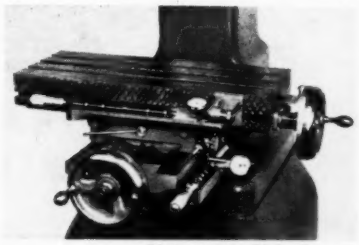
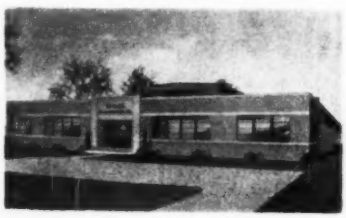


Photo courtesy Linley Bros. Co.

End measuring rod equipment shown installed on a Linley jig borer table.

MICROBORE MOVES TO ROYAL OAK

DeVlieg Microbore Company's new plant in Royal Oak, Mich., is now in full operation with substantially increased facilities to



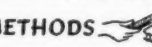
cater to the expanding demand for precision cutting tools.

The new building utilizes 15,000 sq. ft. of floor space to accommodate the fifth Microbore plant expansion in five years. Existing plants include provisions for an early addition to the present structure.

Soon after the move to the large modern plant, the company announced the appointment of Superior Detroit Co. as exclusive sales representatives in Michigan.

IS YOUR GEAR DEBURRING AS MODERN

AS THE CAR YOU DRIVE?

IT'S A SAFE BET YOU AREN'T DRIVING A 1925 MODEL BUT WHAT ABOUT GEAR DEBURRING? ARE YOU STILL USING SLOW AND COSTLY, OBSOLETE METHODS  TO DEBURR GEARS?

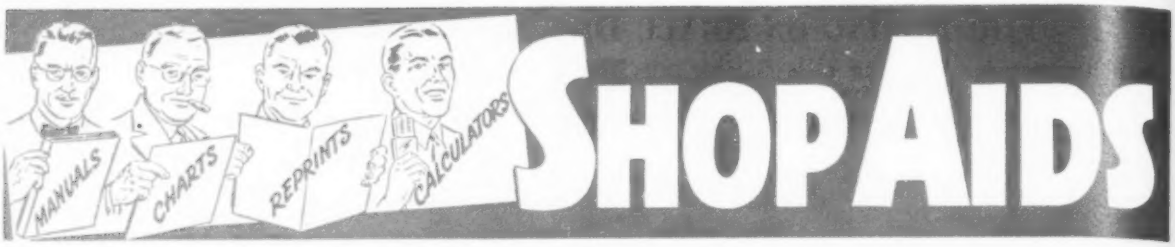
WHY NOT DEBURR AND CHAMFER THE ENTIRE TOOTH FORM AUTOMATICALLY AT HIGH PRODUCTION RATES ON A MODERN BURR-MASTER? EITHER SPUR OR HELICALS; EXTERNAL OR INTERNAL; SPLINES TOO . . .

Ask for: Bulletin 103-60 for details on external Burr-Masters

Bulletin 103-81 for details on internal Burr-Masters

14230 BIRWOOD AVE. MODERN Industrial Engineering Co. DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1011



Use postage-free Inform-A-Gram Key Number Card for your request

Custom-Molded Parts of new ACE glass-reinforced plastics are the subject of Bulletin GRP-1, published by American Hard Rubber Co., 93 Worth St., New York 13, N. Y. New high-pressure molding techniques which permit economical production of complicated shapes with metal inserts if required, are described. Data on matched-die metal molding for mass production of relatively simple shapes with uniform cross-sections is also given. Get your copy from American Hard Rubber, or — **Circle Inform-A-Gram No. C1.**

An Up-To-Date Bronze Electrode Comparative Chart (54D-203), listing all known brands of aluminum, bronze, phosphor bronze, nickel-aluminum bronze, and manganese bronze electrodes on the market, for use in electrode selection has been compiled by Ampco Metal. Copies of the chart are available from Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis., or — **Circle No. C2.**

Post Mortems of Shaft Failures are easily made with the new Rodney Hunt trouble-shooting chart. By comparing the actual roll shaft with fracture drawings presented in "Roll Shaft Fatigue," mill engineers can rapidly identify causes of failure, enabling improvement of present design and extension of life of roll shafts. Basic fracture appearances of fatigue failure in shafts operating under various load conditions of reverse bending and rotation are shown in simplified line drawings, each concisely explained. Copies of Report No. 5 are available from Rodney Hunt, Machine Co., Dep't IR, Orange, Mass., or — **Inform-A-Gram No. C3.**

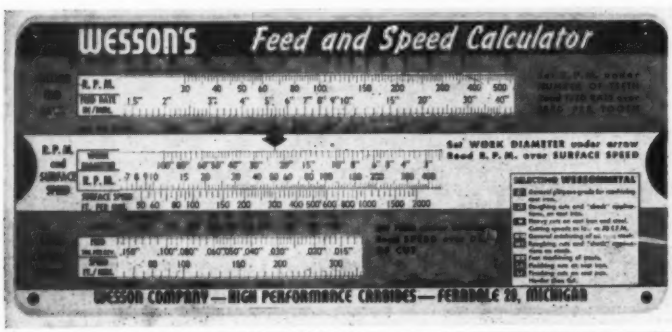
"How to Straighten Pipe and Tube" analyzes two basic straightening methods—two plane vs. rotary machines—with 11 illustrated case histories reporting the production performance of rotary straighteners working a variety of pipe and tubing in both small and large metalworking plants. The bulletin reviews the many comparatively new uses for tubing, presents the reasons for having straight tube prior to forming and fabricating operations, and gives information on the design and use of entry and delivery tables, flood lubrication, single and multi-speed drives vs. variable speed drives, and the design and performance of straightening rolls in a rotary-type machine. Mackintosh-Hemphill Co., 901 Bingham St., Pittsburgh 3. **Circle No. C4.**

A General Tubing Catalog which lists information on the selection and application of 46 principle analyses of tubing has been published by Superior Tube Co. Bulletin 40, "A Guide to the Selection and Application of Superior Tubing," groups the 46 analyses into five classifications: stainless steel, nickel and nickel alloys, carbon and alloy steels, beryllium copper, and titanium. A short summary of the principle properties of each analysis and its normal production limits is given along with notes on Superior's seamless and "Weldrawn" tubing The properties of six glass sealing alloys used primarily for glass-to metal seals in the electronic and electrical manufacturing industries are also covered. Superior Tube Co., 1733 Germantown Pike, Norristown, Pa. **Circle Inform-A-Gram No. C5.**

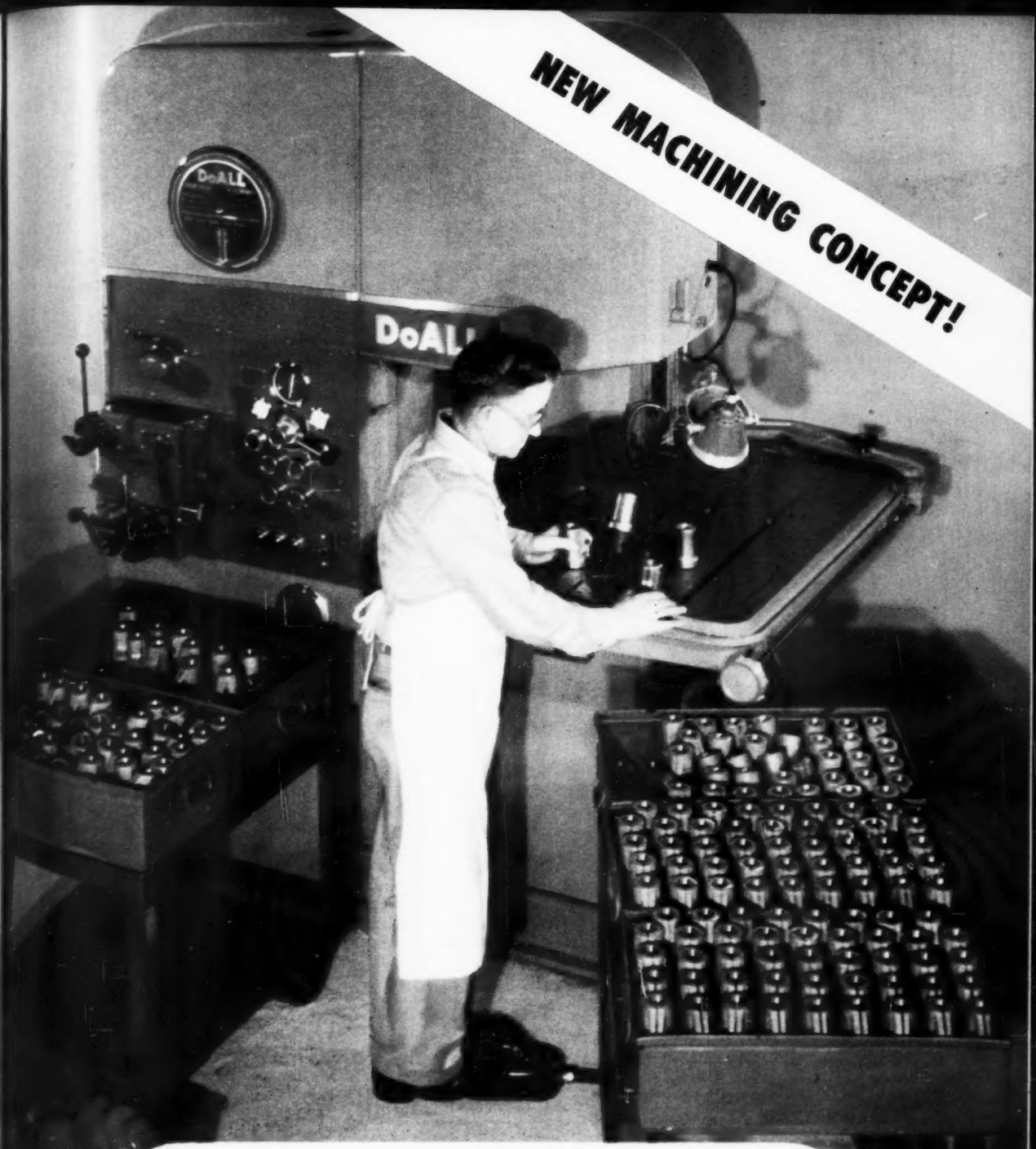
Hundreds of Ways in which pressure-sensitive tapes serve the nation's metalworking industry are described in a new manual prepared by Minnesota Mining & Mfg. Co. The manual, containing 311 illustrations, is a survey of a few represen-

tative applications showing where, how, and why these tapes are used by the industry—from machining, electroplating, and fabricating operations to plant maintenance and product promotion. Minnesota Mining & Mfg. Co., Dep't P537, St. Paul, Minn., or — **Circle Inform-A-Gram No. C6.**

The Tempil® Preheating Chart lists approximate compositions and recommended preheat temperatures for 79 commonly used metals and alloys, including plain carbon steels, high tensile steels, medium chrome moly steels, and plain chrome steels. Factors influencing temperatures and the desirable effects of correct preheating on metal properties are enumerated. Tempil® Corp., 132 W. 22 St., New York 11, N. Y. **No. C7.**



This Feed and Speed Calculator is offered by Wesson Co., Ferndale 20, Mich. On the side pictured are milling feed rates, rpm and surface speed rates, steel cutting speeds, and a Wessonmetal grade selection table. The reverse side gives turning and boring feeds and horsepowers, a carbide comparison chart, hardness conversion table, and table of decimal equivalents.
Circle Inform-A-Gram No. C8.



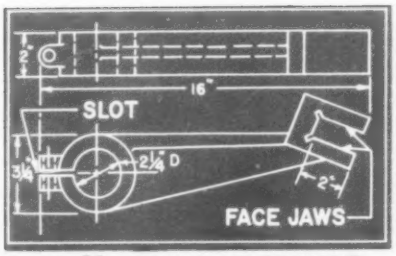
Production Band Machining Saves up to 50% and More over Other Methods . . .

Slotting . . . splitting . . . notching . . . cutting grinding reliefs . . . contour cutting . . . angle cutting—are a few of the production line operations formerly done with milling machines, shapers, planers and lathes, which are now being done in a fraction of the time at far less cost with the new DoALL power-feed Contour-matic Band Machines. Just look at the savings that resulted on the jobs shown on the next page.

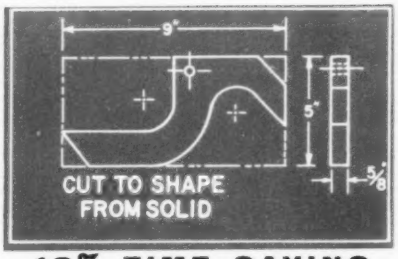
DoALL

The DoALL Company
Des Plaines, Illinois

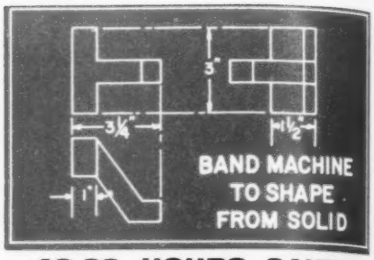
Typical Jobs Done Faster at Lower Cost by DoALL Production Band Machining!



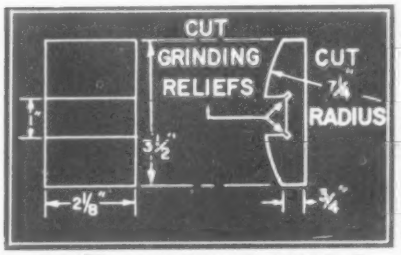
53% TIME SAVING
in cutting .100" slot and facing two 2" x 2" cast jaws. 150 pieces formerly milled in 13.15 hours; now band machined in 6.25 hours.



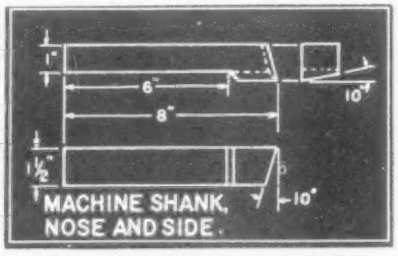
19% TIME SAVING
cutting 175 levers from plate. Formerly torch cut and ground in 29.22 hours; now band machined in 23.62 hours with no grinding required.



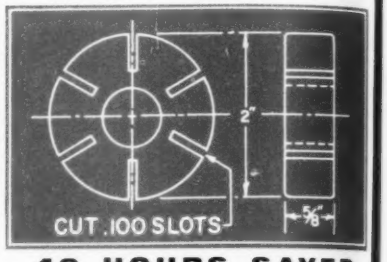
46.28 HOURS SAVED
cutting mounting bracket from solid. 75 pieces formerly shaped in 60.0 hours; now band machined in 13.72 hours—77% time saving.



56% TIME SAVING
in machining radius and grinding reliefs. 50 pieces formerly milled in 3.10 hours; now band machined in 1.35 hours.



58 HOURS SAVED
machining tool shank nose and side. 500 pieces formerly produced in 99.5 hours; now band machined in 41.5 hours.



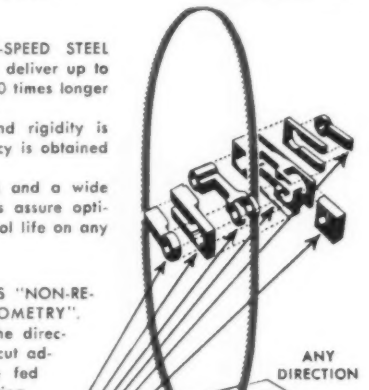
48 HOURS SAVED
cutting .100 x .4375 slots in rotors. 2000 formerly milled in 66.6 hours; now band machined in 18.6 hours—72% less time.

NEW DoALL DEMON HIGH-SPEED STEEL SAW BANDS are available to deliver up to 6 times faster cutting, up to 10 times longer life than carbon steel blades.

Greater machine power and rigidity is now provided. Highest accuracy is obtained —cuts are square and true.

Variable speeds and feeds and a wide range of different band tools assure optimum production, finish and tool life on any machinable material.

THE BAND MACHINE PERMITS "NON-RESTRICTED MACHINING GEOMETRY". There are no restrictions to the direction of cutting action as the cut advances. Hence, work may be fed to the narrow, continuous-cutting band tool along either a straight or "contoured" course. And unwanted material is "sliced off" in whole sections.



New DoALL Contour-matic band machines have opened up an entirely new machining concept. An automatic hydraulic power feed table carries the work into the thin continuous-cutting band tool. Integral recirculating coolant system and air jet promote high cutting rates and long tool life. Cutting forces hold the work down to the table—only the simplest fixtures are required. Tooling cost is far less than for other machine tools. Setup and floor to floor time is greatly reduced.

Faster cutting...lower tooling cost...lower capital investment (a DoALL power feed band machine costs but ⅕ to ½ as much as production milling machines, shapers or planers) — these are the money-saving advantages of DoALL *production band machining*. For complete details call your local DoALL Store—see classified listing in your phone book—or write THE DoALL COMPANY.

NEW FILM "Production Band Machining" now available showing operation of this new machining concept.

ASK FOR FREE DEMONSTRATION at your plant. There is absolutely no obligation—a DoALL Demonstration Unit will pull up in your "back yard" and show you production band machining in action.

Call Your DoALL Service-Store
DoALL
SAW BANDS
DoALL CASE BLOCKS
DoALL GRANITE PLATES
Machine Tools • Cutting Tools • Measuring Instruments
Shop Supplies • In Stock
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EDUCATIONAL STUDY WALL CHARTS
Economic Principles
$1.00 each postpaid
Lower quantity prices.

Friendly DoALL Stores... (in 40 cities)

Personalized Service...Complete Stocks...Local Delivery

Honing Drill Jigs on a Radial Drill

Honing as well as conventional drilling operations are performed on a Carlton radial drill installed at the Westinghouse Electric Corporation. A honing attachment on this drill makes possible the honing of drill jigs, spiders and miscellaneous items.

Holes from 2" to 5" in diameter have been worked, although

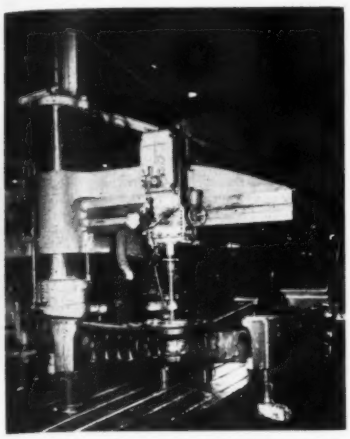


Photo courtesy The Carlton Machine Tool Co.

smaller and larger holes can be handled, whether they be blind or through.

Although Westinghouse requirements call for only a 12 to 15 micro-inch finish, it is possible with this radial drill and honing attachment to get the finish to within 1 micro-inch.

Tolerances on diameters are held to within 0.0002". This has improved the quality of the work, and as a result of making holes more uniform in size, Westinghouse has experienced a savings in production costs.

The coolant for the hone is housed in a special tank separate from the lubricant used for conventional drilling, and one set of stones usually lasts for the complete job, or an average of 12 holes.

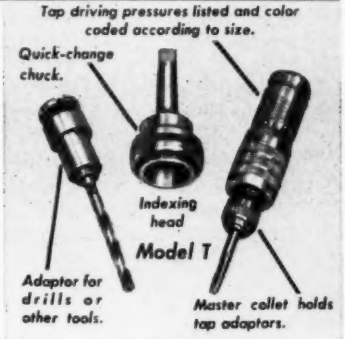
Before Westinghouse installed this equipment the operation was performed as follows:

The holes were first drilled, then bored to size and then reamed and lapped. This was a delicate operation and usually resulted in holes of non-uniform size. To eliminate this condition, the largest hole was lapped first and the rest of the holes were lapped so that they conformed to that size.

Stop Breaking Your Taps...
Use Wickman Tapping Attachments

INSTANT PRE-SELECTION OF TAPPING TORQUES

Pre-selected tapping torques are instantly obtained with Wickman Attachments by presetting the pressure on a two tooth clutch to the required tap size—the highly resilient pressure unit allows the clutch to slip when tap is overloaded.


Tap driving pressures listed and color coded according to size.
Quick-change chuck.
Indexing head
Model T
Adaptor for drills or other tools.
Master collet holds tap adaptors.

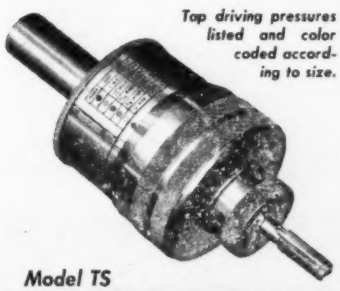
WICKMAN HIGH SPEED TAPPING ATTACHMENTS (Model K)

—are furnished with Morse Taper Shank attached as an integral unit. Special shanks furnished on request.

WICKMAN COMBINATION TAPPING ATTACHMENTS (Model T)

—provide for efficient interchangeability of tooling. Adaptors for holding taps, drills, reamers, counterbores, etc. can be inserted in the same quick-change chuck.

Models K & T sizes and range: from 3/16" to 1 3/4".



Model TS

WICKMAN TAPPING ATTACHMENTS FOR TURRET LATHES (Model TS)

—are considerably shorter than Models K & T. They also permit presetting of tapping torque, thus preventing tap breakage.

Model TS sizes and range: from 3/16" to 1".

For further information on this unusual line of tapping attachments, write to:

THE Wickman MANUFACTURING CO.
10329 CAPITAL AVENUE
(OAK PARK)
DETROIT 37, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1031

LUCAS TOTE PANS

HELP SOLVE PRODUCTION PROBLEMS!

Lucas Tote Pans are built for long wear and ease of handling. Designed for every shop use—storing materials, holding parts for convenient handling by machine operators and at assembly lines, Lucas Tote Pans are available in nesting type, stacking type, straight side and assembly or bench pans. Lengths from 10" to 32", widths from 5" to 23" in standard sizes. Other sizes made to your specifications.

For Further Information, Write

J. L. LUCAS & SON, INC. Bridgeport 5P, Conn. Tel. CLearwater 9-3393

CIRCLE INFORM-A-GRAM KEY NO. 1032

ALUMINUM SPOKE WHEEL FORGED ON GIGANTIC PRESSES

Aluminum forgings, a basic structural material in modern aircraft, made possible an outstanding design advance in 1955 passenger cars — the aluminum spoke wheel on the new Cadillac Eldorado.

The unique air-cooled wheel is the first to be made of aluminum for any modern passenger car.

The production methods used for the new spoke wheel are as interesting and important as its design impact. It is the first major automotive product to be formed on the giant forging presses of the aluminum forging industry. These presses that apply thousands of tons pressure to forge aluminum, were installed to produce vital structural sections for modern aircraft.

The spoke type or air-cooled wheel was developed by Cadillac, Kelsey-Hayes Wheel Company and Aluminum Company of America engineers. The successful use of an aluminum forging made it possible to produce a lightweight and extremely strong wheel with a surface suitable for chrome plating.

Photos courtesy Aluminum Company of America

Fig. 1. Aluminum Spoke Wheel — The first aluminum wheel on any modern passenger car—the lightweight spoke wheel on the 1955 Cadillac Eldorado. The extremely strong wheel was forged on a giant press from hot aluminum as are many of the key structural parts on supersonic aircraft.

The forged aluminum wheel, which allows air to flow through the wheel to cool the brake drum, would have been too heavy if produced from most metals. Lightweight aluminum, formed hot by thousands of tons of pressure from a giant forging press at Alcoa's Cleveland works, provided the answer to this problem. The precision possible with heavy press forging also minimizes machining and finishing operations. At the same time, this precision provides improved tire wear because of its balanced, true-running characteristics.

Cadillac designers first conceived the new wheel as a wheel cover which was shown at the

Fig. 2. Forging Cadillac Wheel — Aluminum forgings for the spoke wheel are shown emerging from the final forging operation on a giant press at Alcoa's Cleveland works. The workman in the background is spraying lubricant on the forging dies.

Sizes range from 3/8" to 6" in length—1/8" to 1" in diameter. Precision pins are hardened and ground to .0002" or .001" over nominal diameter—oversized from .002" to .005".

Acme Pins are case hardened to 60-62 Rockwell "C" scale and core hardened to 36-38. These pins will break before bending or mushrooming—preventing misalignment or breaking of doweled parts. A special lubricant is used on pins to prevent scoring when being driven in and out of holes.

Order from your distributor—or write for Acme Dowel Pin folder and name of distributor nearest you.

ACME INDUSTRIAL COMPANY
206 N. LAFLIN STREET, CHICAGO 7, ILLINOIS

Manufacturers of standard dowel pins • Chamfer micrometer gages • Drill jig bushings • Portable bench centers • Roughness comparison specimens • Hardened and ground parts manufactured to order

CIRCLE INFORM-A-GRAM KEY NO. 1041

General Motors Motorama show in January, 1953. The cover consisted of several stamped, steel rings assembled together with a number of die cast spokes radiating from the hub section. The obvious question was raised, "Why not make the entire wheel of aluminum, incorporating the spoke idea?" Alcoa's development division in Cleveland began the job of working out an acceptable wheel design in cooperation with General Motors.

It was decided that this wheel should be made as a forging to achieve maximum strength with minimum weight and to provide a high quality surface for chrome plating or other finishing operations. Because of the sharp details of the wheel, and its intricate design, mechanical polishing before chrome plating was impossible.

General Motors designated the Kelsey-Hayes Wheel Company as the manufacturer of the wheel to be produced from the Alcoa forgings. The final design details of the forging were worked out between Alcoa, Kelsey-Hayes, and General Motors.

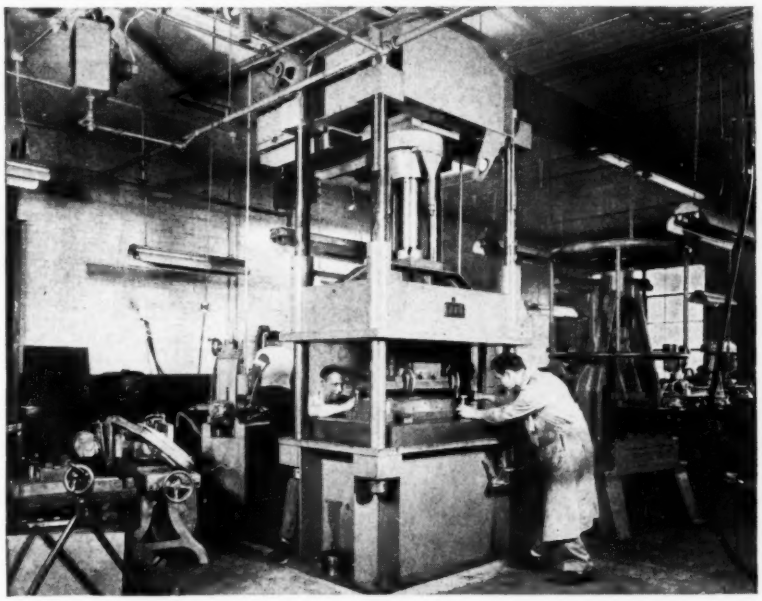
CARBIDE TOOL LIFE INCREASED 320%

A single point carbide tool designed for screw machine use formerly produced a maximum of 25,000 cold rolled steel pinion shaft parts but now delivers over 80,000 pieces before resharpening. This great increase was achieved by merely subjecting the tool to a quick Vapor Blasting treatment, a "Liquid Honing" process adopted in many tool rooms and machine shops to improve cutting tool life.

Photo courtesy Vapor Blast Mfg. Co.

The advantage of Vapor Blasting carbide tools is graphically illustrated. Photo shows the edges of the same tool magnified 125 times. Top, tool sharpened in usual way indicates a "saw-tooth" edge and obvious grind lines — good for 25,000 pieces — with numerous rejects. Lower portion, Vapor Blasted, shows smoother cutting edge, blended grind lines.

The tool is used on automatic screw machine operations at a large Toronto, Canada plant. Formerly the tool was sharpened by "green grit", and diamond-wheel finishing, but showed a saw tooth roughness and prominent grind lines under magnification which caused numerous rejects, and at best produced parts with from 50 to 70 micro-inch finish. After treatment by Vapor Blasting with 1250-mesh abrasive, the edges were smooth, grind lines blended out, and the tool was capable of producing a finish of from 25 to 30 micro-inch. At the last check, the tool had produced 80,000 parts and was still going strong. It was noted that the tool actually improved after cutting the first several thousand pieces, working in cold rolled steel. Another interesting observation in the test was that although carbide is one of the hardest tool metals used, the Vapor Blast 1250-mesh abrasive also blended out grind lines to improve the surface of the tool.



The diemaker who made a nuisance of himself

This is the story of Three Star Manufacturing Co.—a custom diemaker who serves a number of manufacturing plants in Chicago.

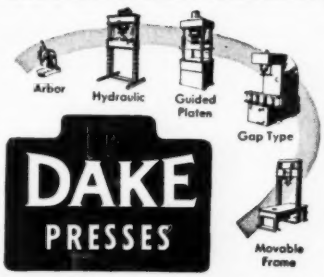
As in most such shops, his only means of trying out dies was a hand power screw press which sometimes needed six or seven men to get the needed pressure.

Large dies had to be tried out on his customers' production presses . . . which required drayage ($15 to $20 each way) and interruption of his customers' production. It meant both expense and nuisance to his customers and himself every time a die had to be tested.

Now he has ended the nuisance by installing the press shown above in his own shop. It not only saves time and money, but avoids the embarrassment of having workers in his customers' plants see and know that occasionally a die must be taken back for adjustment.

Specifications for single-acting and double-acting die tryout presses in ten air-operated and sixteen electrically operated models are contained in Bulletin 267—sent gladly on request.

Dake Engine Company, 634 Seventh St., Grand Haven, Mich.



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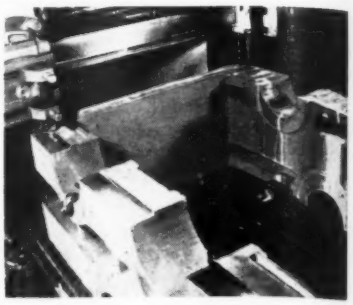
CIRCLE INFORM-A-GRAM KEY NO. 1051

CARBIDE TOOLING SPEEDS LONG CUTS ON CAST STEEL

Long planer cuts on huge cast steel equipment components play havoc with cutting tools. They generate terrific heat causing thermal cracks — regardless of cutting tools' wear resistance in overcoming such obstacles as sand inclusions, surface irregularities of the metal, and designed-in openings or interruptions.

Morgan Engineering Co., which produces heavy equipment for steel mills such as ladle cranes for pouring ingots, open hearth charging machines, overhead cranes spanning as much as 120', complete rolling mills, etc., daily fights the battle of long cuts in machining parts for this equipment — few of them weighing less than 2000 lbs.

Until recently, cutting tools used were babied along to keep overhead costs down — avoiding broken tools, and machine downtime due to excessive tool changing for grinding. In addition, planer speeds were such that full machine efficiency could not be used.



Photos courtesy Carboloy Department of General Electric Co.

Fig. 1. Closeup of carbide tool slicing off almost ½" of metal on one of the two top parallel sides of the rough 2000 lb casting. Cut is being made at 180 sfpm. Note size of interruptions.

Today, with the application of Carboloy grade 370 cemented carbide, cutting speed is up — about four times faster, tool life is more than double, and production time, conservatively is 50% less than formerly required. In addition, machine efficiency went up 15%.

This gain was made in spite of thermal cracks generated — the biggest problem in long planer cuts.

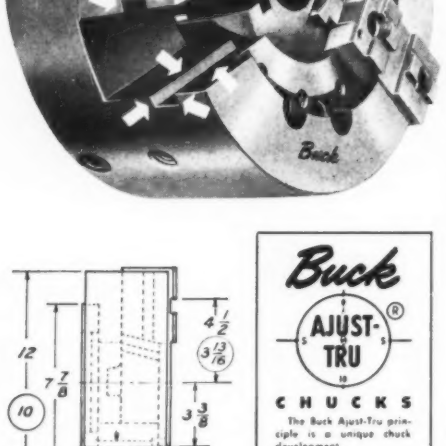
Thermal cracking of the cutting tool in planing is created by the tool getting too hot — then allowing it to "quench" in air too long on the return stroke. At Morgan Engineering, attempts are made to adjust the speed and feed of the machine so planer tools appear a dull red at the end of the stroke.

With the cutting tools formerly used, planer feeds and speeds were adjusted downward in order to get any production at all, but thermal cracking still provided considerable trouble.

A typical job is planing the center section of a gear case used in a steel mill beam straightener. The work calls for both a rough and finish cut, with final tolerances close enough to provide an oil-seal fit when the three sections of the gear case are put together. The work is done on a 100 hp double cutting Guillemin-Sergot-Pegard planer made in France.

After the 2000 lb piece is locked on the planer's 30' table, two tools go into action, one planing one of the two top parallel sur-

Now Hardened Key Ways in Buck AIR CHUCKS



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Now, more than ever, you'll want to consider *all* of the ways the Buck can save you money.

Guaranteed .001" precision. *Jaws can be machined in the tool room,* saving the time-wasting trial and error method *and down time* of fitting on the chucking machines.

Hardened jaws can be used for all operations with the Buck, and jobs run intermittently *without the need to re-true the jaws* for each set up.

Final accuracy adjustments can be made under full air pressure. And for safety, the Buck keeps its gripping power should the air line break.

6", 8", 10" and 12" sizes — 2 or 3 jaws — NO PRICE PREMIUM.

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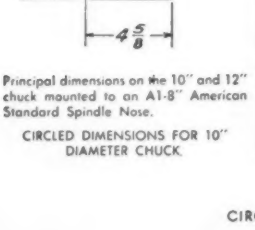

Principal dimensions on the 10" and 12" chuck mounted to an A1-8" American Standard Spindle Nose.

CIRCLED DIMENSIONS FOR 10" DIAMETER CHUCK

Buck AJUST-TRU CHUCKS

The Buck Ajust-Tru principle is a unique chuck development.

Jaws grip work like any other scroll or air chuck. After work is gripped opposed screws near the back of the chuck are used to move the chuck on the adapter to bring work to dead true alignment. No further adjustment needed to chuck duplicate parts.

On hand-operated chucks jaws always come back to within .0005"— on air chucks to within .001".

Buck TOOL CO.
SCHIPPERS LANE
KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1061

Fig. 2. View showing size of casting being planed on GSP (French) planer in plant of Morgan Engineering. Relative positions of the two carbide tools can be seen here on top of casting, left, and on right side.

faces of the casting, the other, the upper portion of the opposite side. Since the cast steel part is planed on all sides, the whole operation required 13 hrs.

One side of the casting has four designed-in interruptions for bearings and the other side six. Thus as the top tool travels along the top length of the casting it leaps more than 6" across the interruptions to resume the cut. An oil groove running the length of the casting in the cutting path at times provides an added obstacle to the cutting tools by "pocketing" chips. The side tool only has the interruptions to contend with, but the fact both tools are positioned in the holder so that only their very tips contact the work doesn't exactly contribute to the ease of machining.

With high speed steel tools, the full 13 hrs were required to complete the job on the part. Maximum speed and feed that could be used was 40 sfpm at 0.062" feed.

Application of carbide tooling shrunk production time between 6 and 7 hrs, including tool honing, tool changing and other adjustments. Between 1,500 and 2000 cu in of metal are removed before thermal cracks appear.

No chip breaker is used on the tools since the shear provided imparts all the curl needed to break the chips. The roughing cuts are taken at 160 to 180 sfpm with feeds of 0.040" to 0.080" and depths of cut from 5/16 to 1/2". There is no chatter or vibration. The planer operates without effort pulling about 40 hp.

Brazed type tools are used with the following angles: 28° side cutting edge angle, 30° negative back rake, 15° positive side rake, 8° end cutting edge angle.

The tools have a relief of 5° on the carbide and a clearance of 8° on the steel along the side cutting edge angle with a relief on the end cutting edge angle of 7°. Radius is held to 1/16" maximum on each tool to generate as little heat as possible. Size of the carbide tips is 1/2" x 3/4" x 1-1/2". The tools are semi-free cutting. The 30° negative back rake protects the carbide from the initial impact blow at the start of the cut with the 15° positive side rake providing the shearing action.

The carbide tools are reground — not for edge wear — but to eliminate thermal cracks. They provide between 10 to 15 regrinds before taken off the job.

Finishing cuts are made with a broad-nosed tool. It has a 15° negative back rake for a distance of 1/16", 15° end cutting edge angle with an end cutting edge relief of 4° primary and 6° secondary.

3 REASONS WHY USERS SPECIFY

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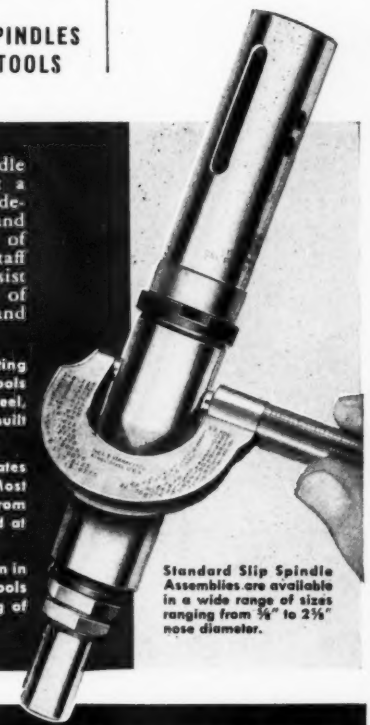

Standard Slip Spindle Assemblies are available in a wide range of sizes ranging from ⅛" to 2⅛" nose diameter.

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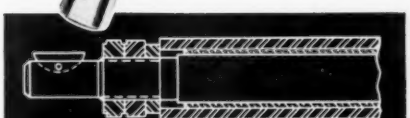

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Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

CIRCLE INFORM-A-GRAM KEY NO. 1071

NEW CARBIDE SIMPLIFIES STEEL CUTTING

A new cemented carbide designed for a wider range of steel machining operations than any previously available single grade of carbide is announced by the Wesson Metal Corporation. It is designed as "Grade 26" and while created primarily to handle all types of steel rough and semi-finish machining — light medium and heavy-duty — it also is proving highly effective on some finishing operations.

The new carbide will cut down the number of grades required for steel cutting operations by as many as four grades, greatly simplifying the problems of tool selection and engineering.

In 95% of all machining operations on which the new "high range" carbide has been applied, it has consistently outperformed all other steel cutting grades with gains as high as 40% in tool life, and is believed to be the closest approach to a "universal" carbide for steel cutting so far produced by the carbide industry.

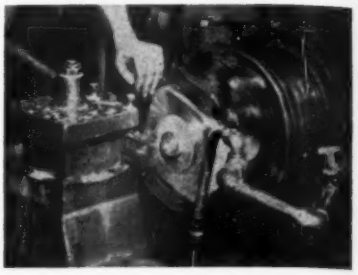

Fig. 1. On this interrupted facing cut on a tractor forged steel brake band anchor, the new Carbide jumped tool life 30% over all other steel cutting grades previously used. Speed on this operation — ranges from 280 sfm to 0 sfm at ⅛" depth of cut.

All applications to date confirm the fact that the gains obtainable are not limited to a narrow range of cutting speeds. Optimum performance extends over a range of from 100 to about 400 sfm. It thus covers 95% of steel machining operations, encountered in industry today. At speeds beyond 400 sfm, specially tailored carbides and tools are required.

Prior to its development, as many as five to seven steel cutting grades were required to effectively and economically machine steels. The wide range provided by the new Wessonmetal Grade 26 will cut the number to 2 or 3.

With regard to machining of the so-called "high temperature alloys", Grade 26 is not the complete answer but the new grade will tend to increase tool life in machining many of these materials.

Fig. 2. Straddle facing the O D of this forged steel final drive gear with Wessonmetal Grade 26 is producing a 40% increase in tool life over all other carbides tried. The operation is being done at .020" feed, 260 sfm at 3/16" to ¼" depth of cut.

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HEAVY DUTY
WHEEL HEADS
"A"
Note the big precision bearings and the big shaft. A pair of precision thrust bearings stabilize the shaft against any axial movement in either direction. (No end play)
The double row cylindrical roller bearings carry the radial loads with ease and at low temperature.
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For continuous production and trouble-free operation THERE'S NOTHING LIKE A POPE SPINDLE WITH ROLLER BEARINGS.

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POPE MACHINERY CORPORATION

[illegible] HAVERHILL, MASSACHUSETTS

CIRCLE INFORM-A-GRAM KEY NO. 1081

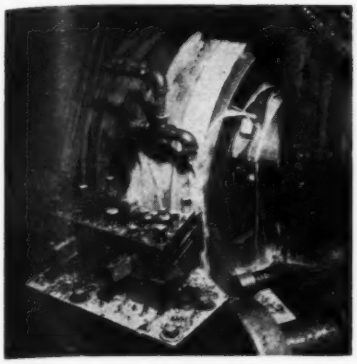

Fig. 3. Closeup of straddle facing operation on tractor final drive gear. Job is performed on a 4F Gisholt Fastermatic.

Some of the typical performances of this new carbide are:

1. 30% increase in tool life on a severe interrupted roughing cut on a tractor brake band anchor. A standard Wesson band-type Multicut tool was used on a 4A Warner & Swasey turret lathe. Cutting speed ranging from 280 sfm down to zero. Feed for this operation is .027" with depth of cut ⅛" (Fig. 1).

2. On another facing operation at the same plant, two solid carbide Grade 26 inserts also mounted in insert-type tool holders, are straddle facing the OD of the tractor final drive gear with a 40% increase in tool life over previous carbides used.

The job is being done on a 4F Gisholt Fastermatic lathe at 260 sfm and 40 rpm. Feed varies from .017" to .020" with average depth of cut from 3/16" to 1/4". (Figs. 2 and 3.)

3. Turning a chrome-nickel-steel ring of 275 Brinell, the new carbide outperformed all steel cutting carbide grades, including one specially developed for the job, by at least 30%. Outside diameter of ring being turned is 75" and all cutting is performed dry. Depth of cut is 1" to 1-1/4" with a .052" feed at 60 to 100 sfm.

4. Straddle face roughing of an SAE 8620 steel, 290 Brinell starter ring gear. Production was increased from 240 to 360 pieces per tool grind. The operation is being performed on a 25 hp Gisholt lathe at 290 sfm with a 9/64" depth of cut and a .018" feed, using insert tools.

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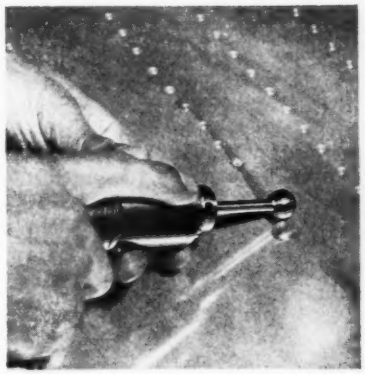
MARTIN BALL-POINT BURNISHING TOOL

Martin Aircraft has developed a small tool which "erases" scratches in aluminum sheet. The tool was made from a common ball bearing which is secured to a rod for use in an electric or air drill. The revolving ball is passed over the damaged skin with a light oil as a lubricant. This powered burnishing tool does a better job and saves 38% time.



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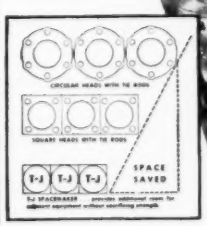

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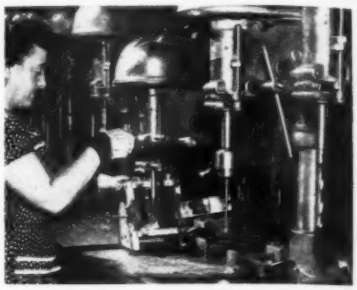
CIRCLE INFORM-A-GRAM KEY NO. 1091

PROPER DRILL PRESS ARRANGEMENT CUTS MATERIALS HANDLING

Much of the production efficiency experienced by A. Schrader's Sons, division of Scovil Manufacturing Co., can be traced to intelligent location of inexpensive drill presses in specific areas of its plant to minimize parts handling and to serve as an adjunct to manufacturing operations.

Why Schrader uses inexpensive drill presses in its everyday production is best explained by the fact that in short-run production schedules on various products, company engineers found they lent themselves to the most economical method.

Makers of a complete line of automotive tire gauges and valves, and a wide variety of industrial air valves used for automatic machine operation, Schrader utilizes 92 Delta drill presses for machining operations on these products.



Photos courtesy Delta Power Tool Div., Rockwell Manufacturing Co.

Fig. 1. One of 10 Delta 17" drill presses used to machine four holes (one at an angle), ream, tap, and spot face the holes in a cushion type air cylinder base at A. Schrader's Sons. Once the machining cycle starts, an operator maintains production of 10 pieces an hour with minimum handling.

Drill Press Arrangement Cuts Handling

A typical operation which exemplifies minimum handling of parts through thoughtful press arrangement is the machining of a cushion type air cylinder base.

In this operation, an employee uses ten 17" press spindles, placed side-by-side, to machine four holes (one at an angle) and ream, tap and spot-face the holes in the part. To permit accurate and quick machining, the part is placed in a box jig.

To begin the cycle, the box jig holding the part is placed under the first drill press to receive a No. 5 drill run to a 31/32" depth. The part is then placed under the next spindle to receive a No. 22 drill to drill a hole which connects into the cylinder. The third spindle spot-faces the No. 5 drilled hole.

For the drilling of two more holes (one for a ½" pipe tap ¾" deep, and the other a 9/16" hole for air inlet) and other reaming, taping and spot-facing opera-

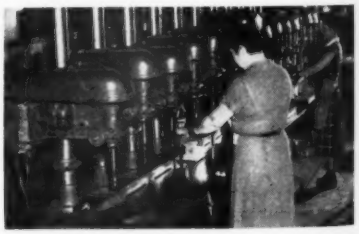


Fig. 2. Partial view of drill press room showing bank of presses arranged for easily moving box jigs from one press to the next for a sequence of operations.

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Big brother to the proven J-2S.
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ROTOR TOOLS
NEW ROTOR J-4S
3/8" IMPACT WRENCH
speeds assembly work
TIME SAVER. 1800 solid blows per minute.
POWERFUL. More power per pound.
EASIER TO USE. Only 4¼ pounds... 6¼" long. No twist. No stalling shock.
LOW MAINTENANCE. Fewer parts. Interchangeable end plates and bearings. Impact parts can be turned over for increased life.
SPECIFICATIONS
J-4S Impact Wrench (Side Handle)
Rated Capacity (Bolt Size) 3/8"
Drive (Standard) . . . . 3/8" square drive.
Optional ½" square drive or 7/16" female hex quick-change chuck.
Hose connection . . ¼" pipe
Ask for Bulletin No. 52
HIGH CYCLE
AIR
THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

CIRCLE INFORM A-GRAM KEY NO. 1101

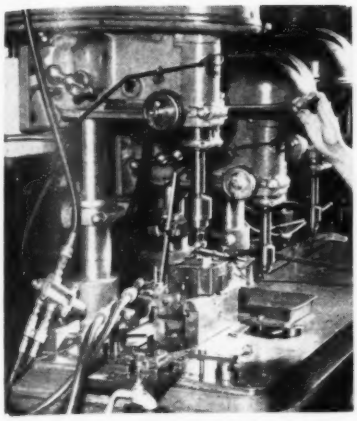

Fig. 3. A drill press, equipped with a specially designed air jig, precision machines a metal lever holder at a rate of 310 pieces an hour — a 50% increase. The machine drills, counterbores and spot-faces in one operation.

tions, the remaining seven spindles are used.

With this drill press machining cycle, the company maintains a production rate of 10 pieces an hour with an absolute minimum of handling and time.

High Production Maintained

In another section of the plant, Schrader uses a large battery of 14″ high speed drill presses for precision machining operations on various small metal parts used for air valves.

As an example, for drilling, spot-facing and counterboring a .281″ hole in a small lever holder used on an air hose, the company uses a 14″ drill press equipped with a specially designed air jig to index the part. A carbide-tipped tool is employed for this drilling operation.

In the machining cycle, the part is placed in the jig and when the operator brings down the press lever, a special cam is tripped which automatically locks the part in the jig and starts drilling. After the part is drilled and counterbored (one operation), the drill press lever on its return travel trips another cam which automatically releases an air valve that cleans the jig of metal chips and, at the same time, ejects the part into a tote box.

Since the conception of this drill press arrangement, production rate has increased from 200 pieces an hour to 310 pieces an hour.

Turret Lathe Work on Drill Press

To counterbore and face a top plate for one of Schrader's industrial air valves in one operation,

. . . *Continued on page 130*

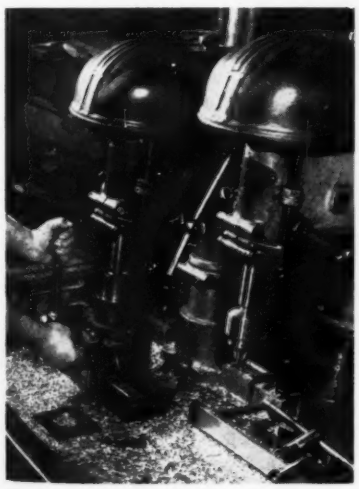

Fig. 4. This Delta 17″ drill press was designed into a turret lathe to counterbore and form a seat in one operation on top plates for industrial air valves. The machine increased production 100%.

5403

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IT'S A *Hamilton Tool*
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CIRCLE INFORM-A-GRAM KEY NO. 1111

New Clearomatic Press Promises to Revolutionize Deep Drawing

One of the limiting factors in deep drawing work has always been that the part of the press stroke in which metal is made to flow "plastically" in the dies must necessarily be done slowly. Slow speed makes it possible to flow the metal into the shape of an automobile fender, for example, smoothly, without wrinkles and without tearing.

At the same time, the press must have a long stroke because the open height of the press has to accommodate the removal of the part after it is ejected from the dies. This combination of a long stroke press with slow drawing speeds has limited production of deep drawn parts — both in the drawing cycle and on operations in other presses.

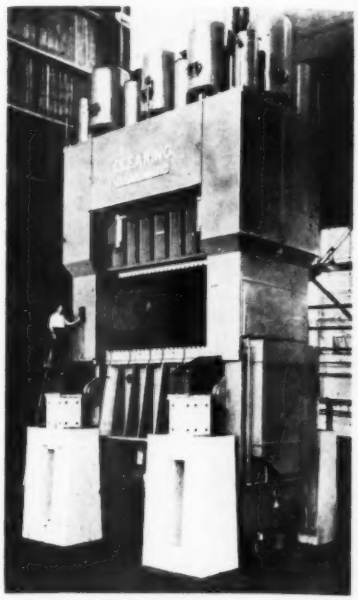

Fig. 1. Clearomatic press which makes it possible to speed up production of deep drawn stampings.

Press manufacturers have attempted to overcome this difficulty by employing both mechanical and electrical methods to speed up the portions of the press cycle not involved in the draw. However, these methods have added greatly to the original cost of the press and to the maintenance problems of the press user.

To meet this situation Clearing Machine Corporation, division of U. S. Industries, Inc., has recently perfected a press, Figure 1, which makes it possible to speed up the production of deep

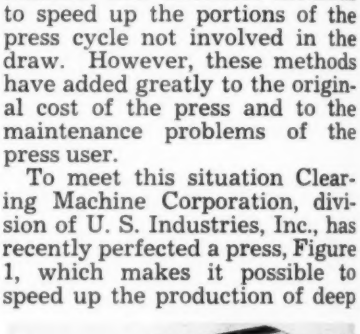

Fig. 2. The performance of the press is achieved with the clutch assembly shown in the cutaway drawing. The clutch employs a system of planetary gears which makes it possible to change automatically from high to low and from low to high speed without loss of flywheel energy.

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drawn stampings. Clearing has named this unique press "Clearomatic".

The new press speeds up the entire cycling rate with a system of planetary gears in the press clutch, Figure 2. The Clearomatic approaches the work and returns to top stroke at an unusually high speed, Figure 3. The drawing

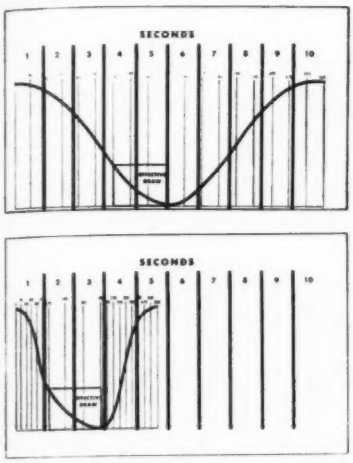

Fig. 3. The top motion curve graphically represents the slide speed of a conventional press in terms of time. The full cycle requires 10 seconds, or 6 strokes per minute. Note that the "working" portion of the stroke — the actual draw—requires approximately 2 seconds, while the rest of the time is consumed approaching or returning from the work. The bottom motion curve shows Clearomatic press performance. Again, the "working" period is the same as before, as required for the job to be done. Now the "non-working" time period has been further condensed so the complete stroke is accomplished in less than 5 seconds, for a press rating of about 13 strokes per minute. Clearomatic employs only conventional gears and air clutch controls. Exact points of speed change for maximum production can be predetermined and set accordingly.

portion of the stroke is accomplished very slowly — in fact, usually slower than normal in a conventional draw press. However, in this press, the non-working portions of the cycle are accelerated in the ratio of three to one in relation to the draw speed. In this way, over-all cycling time of a press is roughly twice as fast as a conventional press.

The performance of this press is achieved with the clutch assembly shown in cutaway drawing, Figure 2. The clutch employs a system of planetary gears which makes it possible to change automatically from high to low speed and from low to high speed without loss of flywheel energy. At the start of the press cycle, the driveshaft is driven at high speed. The ring gear, planetary gear assembly and the driveshaft rotate at flywheel speed.

At a predetermined point above the work, the high speed driving unit is automatically disengaged and the low speed unit is engaged. Now the driveshaft is driven at 1/3 of flywheel speed through the planetary system. The drawing part of the stroke is accomplished at the necessary and desirably slow speed of the low speed unit. The point at which drawing speed begins can be changed by a simple adjustment in the control system in order to accommodate a number of drawn parts of different depths.

When the draw is completed, the high speed driving unit automatically engages, returning the slide quickly to top stroke.

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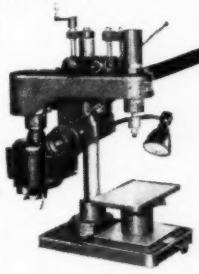

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CIRCLE INFORM-A-GRAM KEY NO. 1131

Is Chrome Carbide The Ideal Gage Block Material?

by H. J. Chamberland
East Longmeadow, Mass.

The applications for which grade 608 chrome carbide exhibited so many unusual properties, when it was introduced, have as a whole proved successful. Early technical data on the subject particularly indicated that this man-made metal was at long last the answer to the perfect gage block. However, time has shown that the possibilities of the new metal in this connection had been somewhat overestimated.

No gage block manufacturer has accepted grade 608 chrome carbide exclusively, yet, such gage blocks have beyond any doubt a time and place and are therefore available. In some cases the metal was definitely given too limited and undue consideration in this respect. Other manufacturers spared no expense to exploit its merits and concluded that it was not the ideal gage block material after all.

The majority of experts in this field seem to agree that chrome carbide gages have no substitutes, economically and otherwise, where conditions of abrasion and corrosion are abnormal and providing the coefficient of expansion of the blocks is not taken too seriously. Extensive research and experiments have brought out interesting facts which seem to indicate that chrome carbide blocks, when used outside a gage laboratory, will introduce errors in all measurements.

1. Chrome carbide absorbs and gives off heat more slowly than does steel. Because of this difference, it presents the additional problem of allowing a different amount of time for stabilization.

2. In the temperature range of from 50° to 110° F., the accepted room temperature variances, the coefficient of expansion of grade 608 chrome carbide is 4.5 x 10^{-6} in./in./°F.

3. It was also discovered that the metal actually has two coefficients of expansion. The one in the direction of the pressing of the powdered compact is 4.5 and the one in opposite direction is 3.5. Were the gages fabricated with the gaging surfaces in the wrong plane, the error in coefficient of expansion would of course be even greater.

4. Repeated tests on a 5" piece of steel, with chrome carbide gages at a differential of only 10° from 68° F., show that it will be made in error by one ten-thousandths of an inch. Whereas "old faithful" steel gages reduced the observational error to a few millionths of an inch.

The coefficient of expansion of chrome carbide gage blocks now in use is rated at 4 x 10^{-6} in./in./°F., as compared to 4.5 per tests herein outlined and 4.9 as claimed by the producers of the metal. The last figure means an expansion of .0000049" per degree F. in a temperature range of 68° to 248° F. In 1952, when the new metal showed every indication of being generally, if not exclusively, accepted for gage block production, its coefficient of expansion was said to be 6.4 x 10^{-6} in the range of 70° to 1292° F. or approximately that of steel. A year later, this figure was ap-

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parently wrong and was changed to 6.1 which refers only to a temperature range of 300° to 1800° F.

Regardless, there are numerous applications for which the coefficient of expansion disadvantages of chrome carbide may be effectively offset by its many other properties. This applies to all grades of gage blocks since basically they all serve the same purpose. Choice here is by no means a matter of competition but rather one of maximum efficiency per dollar invested.

On the other hand, it should be realized that for every gage block used under laboratory controlled conditions, there are hundreds subjected to temperature variances encountered in most plants. There lies the responsibility of quality control management to decide when to sacrifice the ultimate in precision measurement possible with steel blocks, with no coefficient of expansion computation costs involved, for the far greater wearability and corrosion resistance properties of chrome carbide blocks.

An important factor to bear in mind is that some makes of steel gage blocks have a surface finish that exceeds by far that recommended by the Bureau of Standards. This extremely fine finish provides the blocks with a top rating of wringability which in turn accounts for extended original accuracy. This is important, realizing that if ten blocks are wrung in a combination and the gaging surface of each is worn five millionths, the combined dimension will be one-tenth thousandth of an inch undersize. Micrometers or dial gages could do as well.

It is also true that the original surface finish of steel gage blocks can be extended surprisingly long with proper handling. Burrs, although invisible to the naked eye, as well as rust and corrosion problems only result from disregarding recommendations offered by the manufacturers who still maintain that steel blocks will be indispensable for a long time. That is until some new material is found so perfect as to provide in one package the respective features of each type of block now industrially used. Only then will the original cost be of no concern.

What the purchaser of gage blocks is actually buying is the quality of two surfaces, spaced apart to an accuracy of a few millionths of an inch of the size etched on the block. These two spaced surfaces must be parallel, flat and, above all, must have a near perfect finish to maintain their accuracy. **Save the finish and you save all.**

The industry enjoyed its biggest year in 1953, due to a combination of intensive defense production and preparations for a highly competitive year for civilian business in 1954.

A select new line of precision gages for fine tolerance work has been introduced by S. W. Card Manufacturing Co., a division of Union Twist Drill Co., Mansfield, Mass. Types of gages to be stocked by the company and its distributors include reversible thread plug, plain cylindrical plug, reversible wire type plug, taperlock thread plug, thread ring, and cylindrical ring.

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HORSESHOE MAGNETS UTILIZED AS WORKPIECE LOCATORS

A piercing operation on thin gage steel usually is a simple production procedure. It is so simple that it is an easy matter to produce scrap — if accuracy is involved — if the job is of a long-run nature and, if the operator is not constantly "on his toes."

At Hart & Cooley Mfg. Co., for example, where just such an operation existed, two permanent magnets strategically located in the press die took all the "ifs" out of the job. Both guess work and scrap were eliminated 100%.

The company, which manufactures warm air heating and air-conditioning registers, grills and diffusers of all types, uses an 85 ton piercing press to punch holes in the frame sections of the product. The holes are for positioning the fins of the register in a subsequent operation. In the press work, from 14 to 24 holes are punched in each steel frame simultaneously at each cycle of the press — depending on the size of each formed frame section.

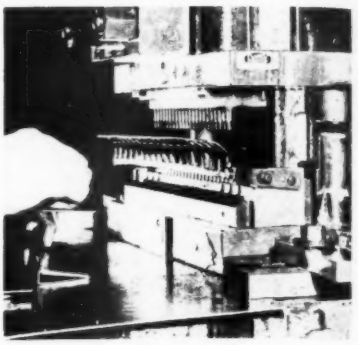

Fig. 1. First step in piercing operation at Hart & Cooley Mfg. Co., in which permanent magnets take all the "ifs" out of the job. Operator here positions frame section for punching operation.

Formerly, the operator picked up a frame section from a nearby tote box, positioned it against the die stop, then actuated the press with a foot pedal. The operator worked fast, and sometimes the alignment of the frame section in relation to the press punches was not always just right. Vibration and the human element were the contributing factors.

It was bad enough to produce a scrap piece at this point, but the big damage came after man-hours were expended in welding the four sides of the register frame together and installing the fins. This led to scrapping the whole assembly. Scrap parts on the job sometimes ran as high as 10% daily, a serious factor in volume output.

In an effort to overcome the situation, Hart & Cooley's production engineers working with Carboloy Department of General Electric Company, redesigned the press die to hold two simple horseshoe-shaped permanent magnets.

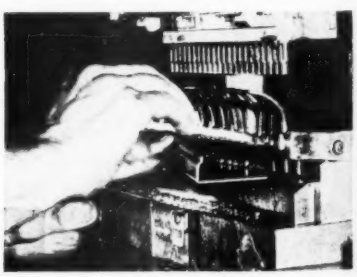

Fig. 2. Second step — operator releases frame section which is snapped tightly against the press die by the "pull" of the two magnets. An air-operated knockout automatically ejects the pierced piece.

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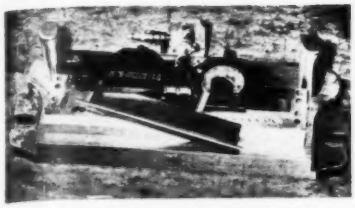


Fig. 3. Press die used in punching operation. Magnet, left, is covered by a non-magnetic cover. Magnet shape employed is shown at right, with frame member in position to show simplicity of the setup.

The magnets used were of the Alnico 5 type with a rated pull of 25 lbs against the proper steel keeper. These were mounted and clamped in the die, encased in non-magnetic blocks of fiber material. In other words, the whole magnet was insulated from the steel die except for the ends facing the die stop.

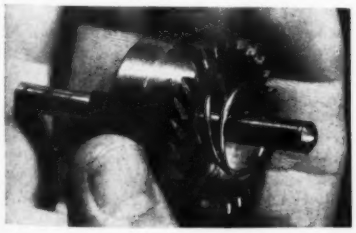
Now scrap no longer is a problem. Furthermore, the permanent magnets simplified alignment of the frames to such an extent that production at the press is slightly higher.

In the operation today, the operator simply positions the steel frame against a stop at the left end of the die. The pull of the magnets does the rest — snapping the part tightly against the die automatically, in perfect alignment with the press punches. An air-operated knockout automatically ejects the pierced piece. The parts handled on this particular press vary in length up to 22".

Ejector Unloads Hole Saw Slugs

Slugs cut by hole saws are disposed of neatly and quickly at TEMCO Aircraft Corporation, by a coil steel spring attached to the hole saw pilot, which serves as an automatic ejector. It saves the operator 2 to 3 minutes a hole by eliminating the job of cleaning out packed slug material.

At TEMCO this material usually is laminated Fiberglass. Hole saws are used to make circular cut-outs in Fiberglass aircraft battery boxes. Slugs formerly were packed so tight that operators often had to disassemble saws from the power hand drills in order to clean the cup-shaped blades.



Plastics Fabricator Frank P. Rose, Jr. hit on the steel spring ejector idea. His solution was so simple that he was able to use it a few hours after he first thought of it.

He wrapped a 3½" length of steel wire twice around the ½" saw pilot. He pulled these two loops tight to secure the wire on the pilot, then bent the rest of the wire into a four-coil, cone-shaped spring.

The spring compresses as the saw makes its cut. When the cut is completed, the spring pressure is sufficient to pop the slug out of the saw. The spring, however, is anchored tightly enough to the pilot so that it is held in place.

Designer Rose said his ejector works on hole saws of all sizes.

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		5/64" to 3/16"	. . . . .	3-F
		3/32" to 1/4"	2-CSG	. . .
		3/32" to 1/4"	2-C4	. . .
		3/32" to 1/4"	4-C	4-F
		5/32" to 3/8"	8-C	8-F
		1/4" to 1/2"	9-C	9-F
		3/8" to 5/8"	10-C	10-F
		1/2" to 3/4"	. . . . .	11-F
	SQUARE or Equiv.	1/16" to 3/16"	14-C	. . .
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"Tooling for Welding," an enlarged 40-page edition, illustrates and describes standard and special tooling, fixtures, and machinery for high quality, high speed, low cost welding. Included are examples of special purpose automatic welding machinery using submerged arc and inert arc processes. Cecil C. Peck Co., 14901 Woodworth Rd., Cleveland 10, Ohio. **Circle Inform-A-Gram No. B1.**

The Adjustable Chip Breaker on the new "Multicut" series toolholders for "Throw-Away" carbide inserts eliminates all carbide grinding, including the chip breaker. The series is completely described and illustrated in Bulletin No. 552-M from the manufacturer, Wesson Co., 1220 Woodward Hts. Blvd., Ferndale 20, Mich. **Circle Inform-A-Gram No. B2.**

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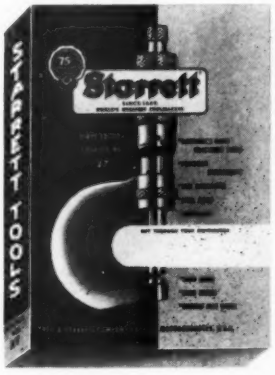
Screw Thread and Thread Chaser Terms, Operating Information, chaser grinding instructions, and a section on "common thread troubles and their correction" make Catalog 136 from Chaso Tool Co., Inc., Box 268, N. Branch, Mich., extra valuable. Thread chasers manufactured by Chaso to fit most styles and makes of dieheads and taps are completely illustrated and described in the booklet. **Circle Inform-A-Gram No. B3.**

Power Industrial Trucks manufactured by Elwell-Parker Electric Co., 4205 St. Clair Ave., Cleveland 3, are the subject of a new, condensed catalog. Standard and specially designed vehicles are discussed and many attachments for increasing the flexibility of the trucks are included. **Circle Inform-A-Gram No. B4.**

Wedge-Lock Action of the Hallwell "Fast Action" tooling and "C" clamps guarantees vibration-proof clamping. All threads are enclosed and protected from weld spatter, etc. Swivel action speeds clamping. Complete details are found in a bulletin from Hallwell Tool Co., 606 S. Hill St., Los Angeles 14, Calif.. or— **Circle Inform-A-Gram No. B5.**

Eighteen Size Combinations of Combined Drills and Countersinks take care of all general centering requirements, according to Chicago-Latrobe's new descriptive folder. Get your copy for sizes and specifications, from Chicago-Latrobe, 411 W. Ontario St., Chicago 10, Ill., or — **Circle Inform-A-Gram No B6.**

Eighty-Five New Tools not before listed plus all other additions to the complete Starrett line of mechanics' hand measuring tools, precision instruments, saws, and ground flat

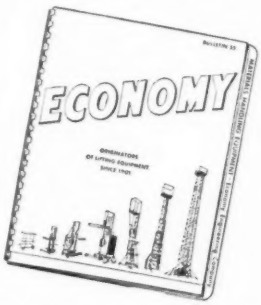


stock are included in big Catalog No. 27 from The L. S. Starrett Co., Athol, Mass. Instructions for using the tools and typical applications are described and illustrated. **Circle Inform-A-Gram No. B7.**

Circle postage-free Inform-A-Gram Key Number for your request

TOOLING and PRODUCTION'S Inform-A-Gram Section is a CARDload of Information

Materials Handling and Overhead Service Machines manufactured by the Economy Engineering Co., 4511 W. Lake St., Chicago 54, are pictured



and described in the company's new Catalog No. 55, filled with illustrations and useful specifications and reference material.
Circle Inform-A-Gram No. B8.

Application and Construction Details of the "Milomatic M-M" vise are combined in a technical data sheet from Wilton Tool Mfg. Co., Inc., 941 Wrightwood Ave., Chicago 14. Catalog Sheet No. 658B includes all necessary dimensions for planning the installation of the vise on production jobs. **Circle Inform-A-Gram No. B9.**

New No. 1 Cutter and Tool Grinder for grinding and reconditioning smaller tools is carefully and completely described in a 20-page bulletin from the manufacturer. The Cincinnati Milling Machine Co., Cincinnati 9, Ohio. Ask for Publication No. M-1852, or —
Circle Inform-A-Gram No. B10.

"Borolon Tumbling Abrasive," a 4-page bulletin, describes aluminum oxide lumps and grains for barrel finishing a wide variety of parts and materials. Get your copy of Form ESA-236 from Simonds Abrasive Co., Tacony and Fraley Sts., Philadelphia 37, Pa., or—**Inform-A-Gram No B11.**

A Guide for Selecting and Using Self-Locking Nuts is contained in the brochure "All Industry Finds Red Elastic Collar the Best," published by Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J. The bulletin shows various types and sizes of lock nuts. **Circle No. B12.**

Automation Machines, Special Machine Tools, and mill-balancing machines are described in a new 12-page catalog from Snyder Tool & Engineering Co., 3400 E. Lafayette Ave., Detroit 7, Mich. One spread in the catalog shows how the company utilizes five basic standard components to make up special automation machines. **Inform-A-Gram No. B13.**

Precision Dowel Pins—both Standard size and Oversize — are illustrated in a 4-page folder by Danly Machine Specialties, Inc., 2100 S. Laramie Ave., Chicago 50, Ill. The pin line has just been re-packaged and re-labeled for convenience in ordering and stocking, and the folder explains the new markings and gives net prices.
Circle Inform-A-Gram No. B14.

"Electrolizing — How it Increases Life and Efficiency of Parts Subjected to Wear, Abrasion and Corrosion," a 16-page booklet, is now available from The Electrolizing Corp., 1505 E. End Ave., Chicago Hts., Ill. Case histories describe increases in wear life on applications ranging from home appliances to military equipment.
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Face Milling Cutters with interchangeable blades are featured in a new catalog from Lovejoy Tool Co., Springfield, Vt. Comprehensive illustrated descriptions of Types A, H, J, L, and C cutters show specifications and application data.
Circle Inform-A-Gram No. B16

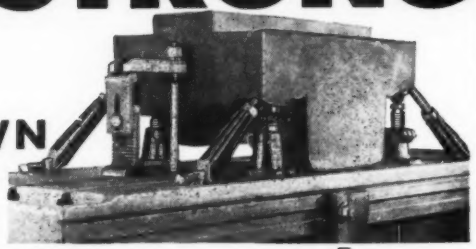
Sine Angle Plates and magnetic chucks are featured in Catalog No. 812 from Taft-Peirce. Construction notes and application data show simple and compound angle models. Get your bulletin from The Taft-Peirce Co., Woonsocket, R. I., or—
Circle Inform-A-Gram No. B17.

All Types of Taps are included in Catalog No. 25 from Royco Tool Co., Inc., N. Branch, Mich. Instructions for tapping most metals and plastic, lubrication information, and a chart of minor diameters are featured.
Circle Inform-A-Gram No. B18.

"Fullanchor" Wheel Brushes and applications for them on Fuller brushing lathes are featured in a new bulletin from The Fuller Brush Co., Industrial Div'n, Hartford 15, Conn. All types—end brushes, cup brushes, primary brushes — and sizes are shown.
Circle Inform-A-Gram No. B19.

ARMSTRONG

SET-UP *and* HOLD-DOWN TOOLS



PLANER JACKS

ARMSTRONG Set-up and Hold-down Tools reduce setting-up time—keep men and machines producing. Designed for use on planers, drill presses, milling machines, etc., they hold work securely and rigidly, and thereby reduce spoilage and prevent costly accidents.

Your local Armstrong Distributor carries ARMSTRONG Set-up and Hold-down Tools in stock in sizes for every operation. Stop haphazard setting-up methods. Provide each of your machines with a full complement of ARMSTRONG Set-up and Hold-down Tools.

Write for Circular

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
5220 W. Armstrong Ave., Chicago 30, U. S. A.

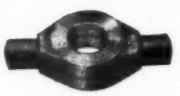
T-SLOT CLAMP

NON-SKID JACKS

STEP BLOCK

UNIVERSAL CLAMP

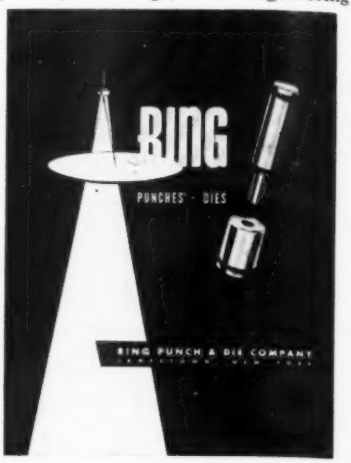
T-SLOT BOLTS AND NUTS



STRAP CLAMPS

CIRCLE INFORM-A-GRAM KEY NO. 1201

Precision Perforating Products — punches, dies, quills, retainers, and counterbores — are described with photos, drawings, and engineering



data in 19-page catalog No. 104 from Ring Punch & Die Co., Jamestown, N. Y.
Circle Inform-A-Gram No. B20.

The Induction-Heating Equipment line is the subject of Westinghouse's Bulletin 85-871. Electrical and mechanical specifications are included and construction features for the high frequency motor generator sets and associated apparatus are discussed. Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa., or—
Circle Inform-A-Gram No. B21.

"'dag' Colloidal Graphite for Assembly and Run-In of Engines and Machinery" contains photos, diagrams, charts and information on the advantages offered by colloidal graphite (chiefly in the form of a petroleum oil dipersion) in the assembly and run-in of machines. Acheson Colloids Co., Div'n of Acheson Industries, Inc., Port Huron, Mich. **Circle Inform-A-Gram No. B22.**

The Rockford Economy Geared Head Lathe is covered in Bulletin No. 903 from Rockford Machine Tool Co., Rockford, Ill. The medium-sized (16"-18") lathes are sufficiently constructed to stand up under general production and maintenance use, while providing the accuracy needed for the toolroom.
Circle Inform-A-Gram No. B23.

The Speed Reducer catalog from Horsburgh & Scott lists new ratios and ratings for worm helical speed reducers, explains increased overhung load capacities, and presents new tables showing detail dimensions of worms and gears to aid in the design of equipment with built-in speed reducers. Ask for Speed Reducer Catalog No. 55 from The Horsburgh & Scott Co., 5114 Hamilton Ave., Cleveland 14, Ohio.
Circle Inform-A-Gram No B24.

Economy in Building Special Gages is obtained by using standard gage units effectively, according to A. G. Davis Gage & Engineering Co.'s thinking. Catalog No. 8 from Davis, 21435 Dequindre Rd., Hazel Park, Mich., shows how combinations of standard gage units are made into special gaging units.
Circle Inform-A-Gram No. B25.

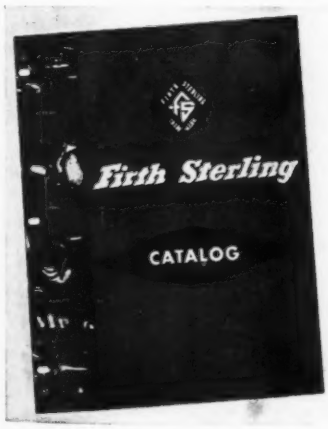
Metal Cutting Band Saws are featured in Bulletin 54 from Machine Tool Div'n, Kalamazoo Tank & Silo Co., 508 Harrison St., Kalamazoo, Mich. Model 8C saw cuts 8" round stock, 16" flat, and 8" pipe. Portable models are shown, as well as band saw accessories.
Circle Inform-A-Gram No. B26.

Developments in Diamond Technology are publicized in a bulletin now available from Diamond Tool Research Co., Inc., 380 Second St., New York 10. "Diamond Abrasives: Powder and Compound" offers a resume of the pros and cons of compound vs. powder abrasives.
Circle Inform-A-Gram No. B27.

New Developments in Eye Protective Equipment are included in the revised catalog of "Eye Savers" products just released by Watchemoket Optical Co., 232 W. Exchange St., Providence 3, R. I. "Stac-Vent," an entirely new principle in goggle ventilation, is introduced in the booklet.
Circle Inform-A-Gram No. B28.

Bench Grinders, Arbors, and sanding discs manufactured by Poly Products Co., 230 E. Pomona Ave., Monrovia, Calif., are featured in a new 8-page catalog. Ball-bearing mandrel construction is the distinctive feature of all Poly grinders and arbors.
Circle Inform-A-Gram No B29.

Firthite Sintered Carbide Blanks, tools, and tool holders and the company's tool steel stock are amply described in the new 48-page catalog from Firth Sterling, Inc., 3113 Forbes St., Pittsburgh 30, Pa.
Circle Inform-A-Gram No. B30.



The Uses of "Rollpin" self-locking fasteners are featured in the Rollpin Catalog (No. 800) published by Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N. J. Engineering data gives information on design, strength, and sizes of the pins.
Circle Inform-A-Gram No. B31.

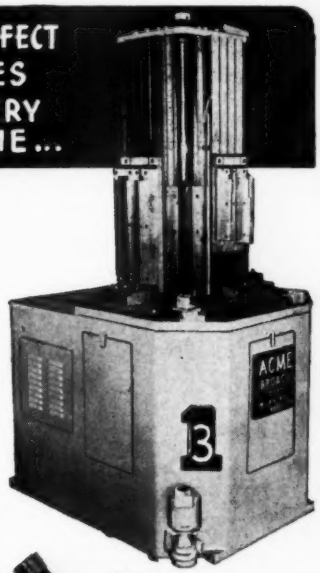
Gages — plugs, rings, snaps, flush pins, and specials — are listed in a catalog published by the manufacturers, Eastern Precision Gage Co., 320 Bayway, Elizabeth 2, N. J. The company's salvage program for worn gages is also discussed.
Circle Inform-A-Gram No. B32.

Power Squaring Shears and Press Brakes are described and illustrated in a 12-page condensed catalog from the manufacturer, The Lodge & Shipley Co., Hamilton, Ohio. Close-up photos show special design features. **Circle Inform-A-Gram No. B33.**

"Balanced Action" Taps and Dies by Winter Brothers Co., Rochester, Mich., are described and illustrated in Catalog No. 22. Special features in the booklet are explanations of the revisions of tap standards, a conversion table with old and new tap designations, and a table of tap limits.
Circle Inform-A-Gram No. B34.

Gun Parts PERFECT ONES EVERY TIME...

HIGH PRODUCTION
using the
ACME MODEL U-31 VERTICAL HYDRAULIC
BROACHING MACHINE



Acme Broach Corporation recently supplied a prominent manufacturer this machine, as pictured, completely tooled for the production of various automatic shotgun parts. . . . The entire outline of some parts is finished by broaching, while only vital forms and surfaces are finished on others. Production is high and six broaching operations are performed simultaneously, as this machine has three broach slides and fixture stations.

Acme manufactures all types of broaching machines, broaching tools and accessories as well as hydraulic presses, gun rifling machines and special hydraulic machines. . . . Let us submit recommendations on your broaching requirements. Write today.

ACME BROACH CORP.
MILAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1211

Rzeppa Universal Joints are the subject of a newly revised catalog published by the Joint Div'n of the Gear Grinding Machine Co., 3901 Christopher, Detroit 11. Constant

Velocity, the principle on which the joints are designed, is described and illustrated along with applications, engineering data, models and sizes, and proper joint selection.
Circle Inform-A-Gram No. B35.

"Ajax Cataract Quench Furnaces for Austempering and Martempering" describes the first new type of Ajax electric salt bath furnace since 1948. An illustrated description, operational data, and specifications are included in Bulletin No. 700 from Ajax Electric Co., Frankfort Ave. at Delaware Ave., Philadelphia 23, Pa., or—**Circle Inform-A-Gram No. B36.**

Name Plates Produced the Metalphoto way are impervious to abrasion, acids, etc. because the legend is imbedded within the anodized layer of the aluminum plate. Standard photographic techniques and solutions are used in your plant to produce the plates. Get complete information from Metalphoto Corp., 2903 E. 79 St., Cleveland 4.
Circle Inform-A-Gram No. B37.

"Advancing Automation through Specialized Service to the Machine Tool Industry" shows applications of Swartz work-holding fixtures on in-line transfer machines, rotary index machines, and trunion index machines. Special tooling for single station machines and standard fixtures are also illustrated. Get your copy from Swartz Tool Products, 13330 Foley Ave., Detroit 27, or—
Circle Inform-A-Gram No. B38.

"Magna-Trode" Electrodes, used in the metal-arc welding of manganese bronze and the yellow brasses without preheat, are discussed in Bulletin W-26 from Ampco Metal, Inc., 1745 S. 38 St., Milwaukee 46, Wis. Information relative to identification, core rod, chemical composition, deposit mechanical properties, current range, and welding procedure is listed.
Circle Inform-A-Gram No. B39.

Columbia Hydraulic Compression Molding Presses for the fast and simple compression molding of plastics are presented in an illustrated bulletin now available from Columbia Div'n, The Lodge & Shipley Co., Hamilton, Ohio, or—
Circle Inform-A-Gram No. B40.

Simplified Mechanical Engraving of metal name plates and products is possible with the hand-operated "Preis-Panto" engravers described in a new bulletin from H. P. Preis Engraving Machine Co., 647 U. S. Route 22, Hillside, N. J., or—
Circle Inform-A-Gram No. B41.

"Rifflers — and Helpful Hints on How to Use Them" presents illustrated descriptions of diesinkers', diemakers', and silversmiths' rifflers and some of their uses. Grobet File Co. of America, Inc., 421 Canal St., New York 13, N. Y. or —
Circle Inform-A-Gram No. B42.

High Production Grinding as well as short runs are the assignments for the Landis 10" and 14" plain hydraulic cylindrical grinding machines. Specifications, accessories, and typical grinding operations are outlined in Catalog B-54 from Landis Tool Co., Waynesboro, Pa., or—
Circle Inform-A-Gram No. B43.

Why you get top savings with

The "CROWN JEWELS"

Buying diamond wheels calls for the same trust in the supplier as buying gem diamonds. Right there is where Norton's long leadership in diamond wheel development and manufacture is your best possible safeguard. Only Norton offers you such long diamond wheel experience to help you produce more at lower cost.

Check these reasons why Norton diamond wheels are the recognized "Crown Jewels" of the entire field:

Norton was first to introduce the three major diamond wheel bond types — resinoid, metal and vitrified.

The sizing, grading and laboratory checking of diamonds used in Norton diamond wheels is done in Norton's own plant.

Norton duplicates specifications for each wheel type and size with utmost accuracy for uniform top performance.

The line of Norton diamond wheels is complete, with sizes and types covering every field — carbides, stone, glass, ceramics, electronics, etc. — where diamond wheels are used.

Norton diamond wheels for every need are quickly available from full stocks in Worcester, five strategically located warehouses and Distributor's stocks.

See your Norton distributor

for further facts on Norton diamond wheel performance and applications. Ask him for the 142-page illustrated booklet, *Grinding Carbide Tools* and for the complete, net priced, diamond wheel catalog. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1221

Over 8,000 Stock Items — gears, sprockets, chains, splines, racks, and worms — plus tools, dies, jigs, fixtures, and machine tools are covered in the 188-page catalog from Universal Gear Works, Inc., 1301 E. McNichols Rd., Detroit 3, Mich., or— **Circle Inform-A-Gram No. B44.**

Solid Carbide Drills, End Mills, centerlaps, midget burrs, rotary files, reamers, and grinding tools are listed and illustrated in a catalog from Grawell Carbide Tool Co., 5680 12 St., Detroit 8, Mich. Ask for Catalog A from Grawell, or — **Circle Inform-A-Gram No. B45.**

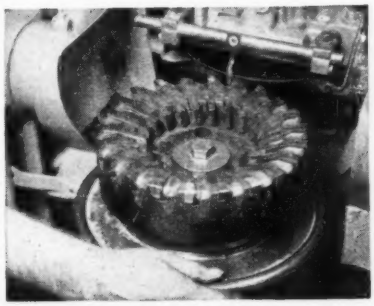
Retaining Ring Supplement No. 1 to Waldes-Kohinoor's catalog No. RR 9-52 contains revisions, corrections, additions, and new product developments in the Waldes Truarc retaining ring line. Get your supplement from Waides Kohinoor, Inc., 47-16 Austel Pl., Long Island City 1, N. Y., or— **Circle Inform-A-Gram No. B46.**

Milwaukee Surface Plates, Angles, box parallels, and straight edges are illustrated in Catalog No. 123, available to TOOLING & PRODUCTION readers from J. C. Busch Co., 170 S. Barclay St., Milwaukee, Wisc., or— **Circle Inform-A-Gram No. B47.**

Norton Diamond Wheels...

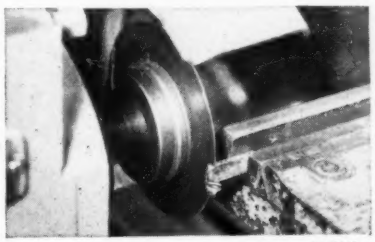
for carbide grinding

For Top Savings In Production Grinding of single point carbide tools, use Norton vitrified bonded diamond wheels. Combining fast cutting action with high resistance to grooving, they're also often preferred for grinding chip breakers and for a wide range of precision grinding. This Norton engineered bond holds each diamond particle for maximum useful cutting action and long, money-saving wheel life.



For Top Savings In Multi-Tooth Grinding, Norton resinoid bonded diamond wheels assure uniform size to each individual cutter tooth. Their extra fast cutting action and long service life are big advantages in precision sharpening. Two bond types — regular, for wet grinding and B6, for dry applications.

For Top Savings In Reconditioning dull or chipped carbide tools, Norton metal bonded diamond wheels are recommended. They're also most economical for many other jobs where durability and resistance to grooving are preferred, rather than a fast rate of cut.



W-1611

Making better products... to make your products better

NORTON

and its BEHR-MANNING division

NORTON: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes

CIRCLE INFORM-A-GRAM KEY NO. 1221

Diamond Particles are firmly bonded in a sintered steel matrix in the "Steelset" process, so they are not pulled out before their useful life is expended. Catalog No. DT-353 on Steelset diamond wheels, drills, and dressers contains specifications and instructions for use. Fish-Schurman Corp., 70 Portman Rd., New Rochelle, N. Y. **Circle Inform-A-Gram No. B48.**

Kinney High Vacuum Pumps are built for top performance in all fields of vacuum processing. They have but three basic moving parts and range in size from ¼ hp to 40 hp. A complete description with operational diagrams is given in Bulletin V-54 from Kinney Mfg. Div'n, The New York Air Brake Co., Boston 30, Mass. **Circle Inform-A-Gram No. B49.**

The "Dehydrafilter" compressed air dehydrator is designed for small volumes of compressed air serving liquid level indicators, purge assemblies, remote control installations, etc. Bulletin C-5154 gives specifications of three models and lists applications for the units. For more information, contact Hankison Corp., 410 Biltmore Bldg., 951 Banksville Rd., Pittsburgh 16, Pa., or— Pittsburgh 16, Pa., or — **No. B50.**

A New Line of Swiss-Made Precision Tweezers is being offered by Grobet File Co. of America, Inc. Made of finest alloy steel, they are particularly suited to handling delicate and tiny parts. Fifteen styles are available and all are described in a catalog page available from Grobet, 421 Canal St., New York 13, or— **Circle Inform-A-Gram No. B51.**

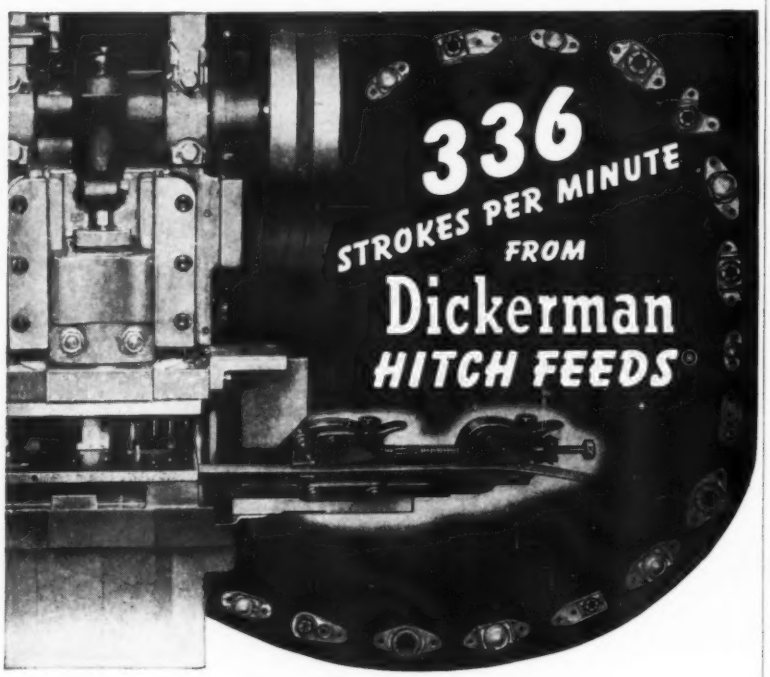
Shop Equipment by Sturdi-Bilt is shown in a new 20-page general catalog. Featured are the "Bulk Bin," three lines of work benches with plastic impregnated wood tops, and

recently developed machine and assembly stands. Various other workshop accessories are also included and fully described. Get Catalog 155 from Sturdi-Bilt Steel Products, Inc., 2501 Peterson Ave., Chicago 45, or— **Circle Inform-A-Gram No. B52.**

Hydraulic Control Manifolds for simplified installation of complicated hydraulic control circuits and for improving hydraulically operated equipment are explained and illustrated in a brochure now available from Almo Tool Co., 11470 Kaltz, Centerline, Mich., or—
Circle Inform-A-Gram No. B53.

The Pocket Catalog of Electric Motor Controls from Furnas Electric Co. contains 46 pages of motor control photos, specifications, and prices. It is a convenient ready-reference for magnetic starters and contactors, push-buttons, combination starters, drum controllers, master, foot, limit, and pressure switches. Booklet No. 5411, Furnas Electric Co., 1072 McKee St. Batavia, Ill.
Circle Inform-A-Gram No. B54.

Materials Handling and Storage Equipment is comprehensively cataloged in a new 20-page booklet from Stackbin Corp., 1223 Main St., Pawtucket, R. I. The complete line of Stackbins, Stackracks, pallets, movable bases, Stackshelves, assembly bins, nail bins, trucks and tool storage equipment is illustrated and described in detail.
Circle Inform-A-Gram No B55.



AN UNBELIEVABLE — YET TRUE — DEMONSTRATION OF DICKERMAN HITCH FEED PERFORMANCE AND ECONOMY!

Aircraft fasteners by the millions roll steadily from the Dickerman-equipped presses of a leading West Coast manufacturer. Feeding at the incredible rate of 336 strokes per minute, Dickerman 2½" Hitch Feeds have operated flawlessly day after day, month after month — setting new records of production and economy! Moving a .020" thick strip of cold rolled steel into a 3-station piloted die, the Dickerman feeds uniformly advance the strip ⅝" per stroke — with never a "miss" or a jam!

This actual case history is indisputable evidence that *Dickerman hitch feeds will feed precisely at virtually any speed the tooling is built to withstand.* Remember — in the complete, dependable Dickerman line, there's a versatile hitch feed to give MAXIMUM performance and production at real savings of days and dollars.

Send today for descriptive literature on the complete Dickerman line of money-making Die Feeds.

Dickerman

H. E. DICKERMAN MFG. CO.

324-250 Albany St. • Springfield, Mass.

CIRCLE INFORM-A-GRAM KEY NO. 1241

The Accelerated Motion Draw Press is explained in a 16-page, two-color booklet from the manufacturer,

Clearing Machine Corp., Div'n of U. S. Industries, Inc., 6499 W. 65 St., Chicago 38. **Inform-A-Gram No. B56.**

Two New Geargrind Automatics are described in specification bulletins now available from Gear Grinding Machine Co., 3901 Christopher, Detroit 11, Mich. The bulletins cover the company's 30" internal and 36" external form grinding machines for working on gears, splines, and specially contoured parts.
Circle Inform-A-Gram No. B57.

The "Tracer Lathe" was developed because of the success achieved in the application of the Rockford "Kopy Kat" Duplicator to shapers, planers, etc. An illustrated bulletin (No. 1001) on the Tracer Lathe with Kopy Kat Duplicator is now available from Rockford Machine Tool Co., Rockford, Ill., or—
Circle Inform-A-Gram No. B58.

Hydraulic Presses and Die Casting Machines are the subject of a new general catalog from Lake Erie Engineering Corp., Box 68, Kenmore Sta., Buffalo 17, N. Y. This Bulletin 1.1 incorporates a comprehensive chart relating the various types of presses to their most suitable promotion uses. **Circle No. B59.**

O-Ring Information that should prove helpful to designers and users of O-Ring pneumatic and/or hydraulic seals is detailed in a 12-page brochure from Goshen Rubber Co., Goshen, Ind. Data on compounds and groove dimensions and sizes, as well as application diagrams, are included.
Circle Inform-A-Gram No. B60.

The New "S" Series of Automation Cylinders is described and illustrated in a catalog from the Hydro-Line Mfg. Co., 5769 Pike Rd., Rockford, Ill. Detailed drawings of various types of mounts, complete dimensions, and automation cylinder accessory and engineering information is listed. **Inform-A-Gram No. B61.**

The Redesigned Machinist Vise line by Wilton is illustrated in recently published Catalog Sheet No. 662. Stationary and swivel base machinists' vises, combination pipe and bench vises, and jewelers' vises are shown. The Wilton Tool Mfg. Co., Inc. 925-941 Wrightwood Ave., Chicago 14. **Inform-A-Gram No. B62.**

Precision Products — dovetail straight edges, parallel and bridge type straight edges, and semi steel surface and layout plates — are pictured and described in a new bulletin from the manufacturer, Willison & Theemling Rebuilding Co., 790 E. Washington Blvd., Los Angeles 21, Calif. **Circle Inform-A-Gram No B63.**

"Centralized Systems of Lubrication" by Farval dispense the exact amount of oil or grease to every bearing on your machines as often as needed. Bulletin No. 26 from The Farval Corp., 3295 80 St., Cleveland 4, Ohio, illustrates the system and applications of it. Get your copy from Farval, or — **Circle No. B64.**

Free Sliding Die Sets by Marathon Die Set Corp., 1807 N. California Ave., Chicago, are described briefly in a new bulletin. Pins and bushings used are hardened and honed for superior finish and accuracy. Standard dimensions are listed in the bulletin. **Circle Inform-A-Gram No. B65.**

Exclusive Brushing Lathe features of the Fuller units include variable speed drive, choice of power, new setup possibilities, and two-directional brush attack. Get complete details in the "Brushing Lathe and Universal Workpiece Holder" bulletin from The Fuller Brush Co., Hartford 15, Conn., or — **Circle No. B66.**

Super's Carbide Tipped Tools, both special and standard items, are found in Catalog 55 from Super Tool Co., 21650 Hoover Rd., Detroit 13. Special

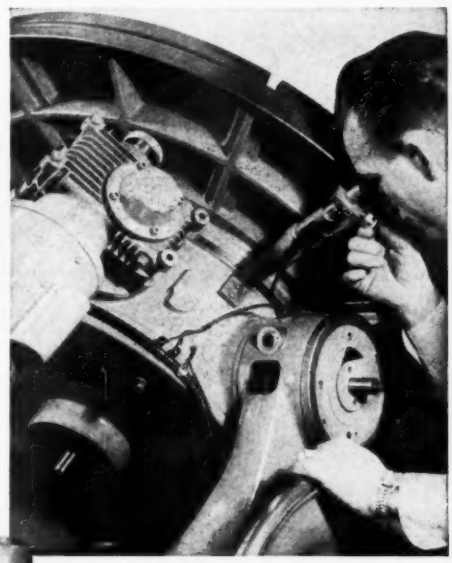
sections give notes on the particular types of tools — milling cutters, reamers, ejector tools, etc. — and operational instructions.
Circle Inform-A-Gram No. B67.

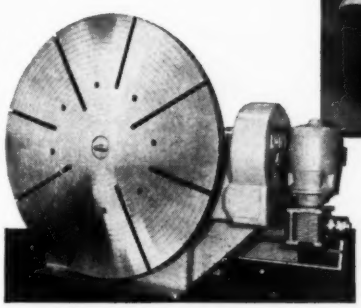
"Stuart's Cutting Oil Bases" offers comprehensive information on various cutting oils manufactured by D. A. Stuart Oil Co., 2727 S. Troy St., Chicago 23. Much of the clearly illustrated booklet covers machining operations and recommended cutting fluids and suggestions for handling cutting fluids.
Circle Inform-A-Gram No. B68.

Two Grades of Titanium tubing and pipe are described in a bulletin from Alloy Tube Div'n of The Carpenter Steel Co., Union, N. J. The advantages and applications of the tubing and pipe are listed, along with physical properties and data on corrosion resistance, machining characteristics, forming, welding, heat treating, and cleaning. Test pictures show conditions the metal can be expected to withstand in application. **Circle Inform-A-Gram No. B69.**

Sheet Metal Machinery of every type is covered in the comprehensive 134-page catalog recently made available by Federal Machinery Co., 134 Grand St., New York 13. The catalog includes many detailed diagrams, charts, and tables for handy reference.
Circle Inform-A-Gram No. B70.

Industry's First High-Precision Universal Inspection Table





The New
ROTAB

ROTAB now gives you fast, accurate checking of complex shapes at a minimum investment in fixtures:

1. **Microscopic Precision**—Direct reading to 5 seconds.
2. **Faster Multiple Inspection**—Simple inspection operations provide closer quality control on radial and angular checking.
3. **Finger-Tip Operation**—Quick acting, positive controls for table tilt and rotation.
4. **Easy Reading**—Checking and measuring planes conveniently positioned.
5. **Four Standard Sizes**—Select the model best suited to your jobs. Face plate diameters available are 12", 24", 36" and 48".

Write for the complete **ROTAB** *story.*

MACHINE PRODUCTS CORP.
6771 East McNichols Rd. Detroit 12, Mich.
Dept. C

CIRCLE INFORM-A-GRAM KEY NO. 1251

Feed Units, Tapping Units, Hydraulic Drill Presses, Index Tables, and fixed center and adjustable center drill heads are described in the 24-page Michigan Drill Head catalog. Pertinent information on multiple drilling applications and technical data is included. Michigan Drill Head Co., Box 4643, Detroit 34, Mich. **Circle Inform-A-Gram No. B71.**

"Steelweld" Single-Point Presses, in sizes from 150 tons, are covered in the new Catalog No. 2019-A from the manufacturer, The Cleveland Crane & Engineering Co., Wickliffe, Ohio. Construction features are outlined and specifications for the presses are listed. Get your copy of the bulletin from Cleveland Crane or, — **Circle Inform-A-Gram No. B72.**

Thermocouples and Pyrometer Accessories are featured in the new edition of Bulletin P1238 from The Bristol Company of Waterbury, Conn. The illustrated bulletin is both buyer's guide and user's manual, containing extensive engineering data on the selection and installation of the proper types of thermocouples, wells, head assemblies, and other pyrometer accessories. **No. B73.**

"Contour-matic" Machines — machines that saw, file, polish and grind and which feature hydraulically-powered tables and controls — are described in a 20-page catalog just

DoALL Contour-matic
BAND MACHINES
FOR SAWING — FILING — GRINDING — POLISHING
Designed for PRODUCTION and TOOL SHOP WORK
with the Sensational Demon High-Speed Steel Blade

released by The DoAll Co., Des Plaines, Ill. Production applications of the Contour-matics are given and the company's line of manually operated Contour sawing machines and accessories are listed. **Circle Inform-A-Gram No. B74.**

Series 1600 Drilling Units by Universal Gear Works, Inc., Detroit 3, Mich., are the subject of a new specification bulletin. Both bench and floor models are shown. **Circle Inform-A-Gram No. B75.**

Dow Corning 41 Grease, a silicone fluid-carbon black mixture designed for high temperature, slow speed bearings, is the subject of a 6-page brochure from Dow Corning Corp., Midland, Mich. Performance data is featured in the form of illustrated case histories. **Circle Inform-A-Gram No. B76.**

A Complete Line of Plugs and Ring Gages has been added to the list of products manufactured by Winter Brothers Co., Rochester, Mich., manufacturer of precision taps and dies. A complete catalog on Winter Brothers "Balanced Action Gages", including the new plug and ring gages, is now available. **Circle No. B77.**

A Complete Collet Selection Guide for all lathes, millers, and grinders is available for TOOLING & PRODUCTION readers from Hardinge Brothers, Inc., Elmira, N. Y. The Guide Bulletin No. 54 features specification and dimension charts, conversion and interchangeability listings, and prices. **Circle No. B78.**

A Prefabricated Airtube System recently developed by Lamson Corp. is featured in a two-color booklet. A variety of installation arrangements are suggested for laying out and installing the "packaged unit" which connects any two points up to 130' apart. Lamson Corp., Syracuse 1, N. Y. **Inform-A-Gram No. B79.**

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OFFERS YOU THIS SIMPLE, UP-TO-THE MINUTE METHOD
There's no need to make a complete new Die for any type washer or blank. The HOVIS UNIVERSAL WASHER DIES provide a Master Holder and by merely changing 5 SMALL, EASILY REMOVABLE PARTS the new washer or blank is produced . . . Special sets of parts are available for use in Master Washer Units enabling customers to produce irregularly shaped pieces and shallow draws. Multi-Washer Dies are also designed and manufactured.
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CIRCLE INFORM-A-GRAM KEY NO. 1261

TELESCOPING LEG QUICK CHANGES SAW TABLE ANGLE

Temco Aircraft Corporation has equipped a Do-All bandsaw table with a telescoping leg that enables operators to change cutting angles precisely and instantly.

By extending or contracting the adjustable leg, an operator can make cutting angle changes

while the saw is in motion. This is particularly valuable in sawing variable contours.

The operator formerly had to stop the saw to make a change in the cutting angle. This produced an irregular contour with a notch marking every spot where the cutting angle was changed. Notches then had to be removed with a router.

It was possible to cut variable contours with the Do-All, but it was a three-man operation. The operator actuated the saw blade and guided the material. One assistant called out degree changes, using a level and protractor, and a third man supported the table and moved it from one position to another.

By making degree-changing on the Do-All not only a one-man but a one-handed operation, the telescope leg saves an average of 1½ manhours a day on one machine.

Temco Form Block-maker W. D. Smith developed the leg expressly for the Do-All saw in the form block section. This particular machine is required to cut ever-changing angles in aluminum, steel, masonite, Parkwood and other form block materials.

Before Smith's degree-changer was installed, a friction lock had to be loosened while the table was adjusted by hand. Now, the friction lock remains in one position — tight enough to take some table weight off the new leg, but not so tight that the table won't move when the leg is telescoped.

The leg consists of a length of threaded drill rod which fits inside a sleeve made of 1¼" tubing. Dowell pins secure the leg to the base and to the table of the Do-All saw.

An adjusting wheel is attached at a convenient height on the leg. The wheel has a threaded hub which meshes with the threaded drill rod. A turn on the wheel, therefore, telescopes the drill rod in or out of the stationary tubing, lengthening or shortening the table leg.

The operator uses the Do-All degree scale to measure table angles. By contracting the telescope leg to its shortest length, he can tilt the table to a maximum angle of 47°.

THE Hause Holomatic DRILL UNITS

are fully Automatic

for DRILLING... TAPPING... THREADING... REAMING... CHAMFERING AND SPOT FACING ON SPECIAL PRODUCTION MACHINES

4 INCH STROKE
200 INCH-POUND TORQUE CAPACITY
300 to 15,000 RPM SPINDLE SPEEDS

AIR ACTUATED HYDRAULIC FEED
FOUR MODELS TO CHOOSE FROM

The Hause Holomatic Drill Units use shop air line pressures for thrust and feature a self-contained hydraulic system for positive spindle travel control and feed regulation. Rapid traverse distances and feed rates are infinitely adjustable in both advance and retract movements of each cycle. Automatic, semi-automatic or manual cycling, skip-drilling, manual jogging and positive stop with dwell operations are all easily achieved. A built-in air control valve simplifies set-up and reduces installation costs. All models mount at any angle.

WRITE FOR DESCRIPTIVE LITERATURE

Hause ENGINEERING
MONTPELIER, OHIO

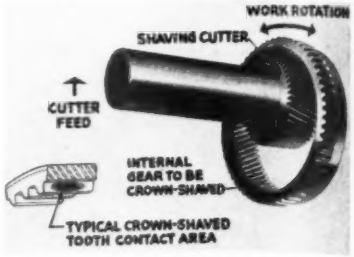
CIRCLE INFORM-A-GRAM KEY NO. 1271

New Plunge Cut Process for Shaving Internal Gears

Internal gears produced by a new Red Ring plunge-cut rotary shaving process have the same inherent advantages of reduced noise level and increased wear life as external gears having the Elliptoid (crowned) tooth form originated by National Broach several years ago.

Gears can be produced by this new plunge-cut process, with or without the crowning feature, approximately twice as fast as conventional methods using cutter or work reciprocation.

The tooth shape produced by the new process is like that of the Elliptoid tooth form. Usually teeth are slightly thinner at the ends than at the center. The maximum tooth thickness zone can be positioned either side of center, if desired. The amount of crown can be varied by the new method. This crowning feature, which in tooth thickness variation amounts to only a few tenths of a thousandth of an inch per inch of tooth face width, avoids tooth end bearing caused by minute errors or gear deflections under load.



Photos courtesy National Broach & Machine Co.

Fig. 1. A schematic photo showing how the new Red Ring plunge-cut rotary shaving process produces crown-shaved tooth forms on spur and helical internal gears.

The process is particularly adaptable to internal gears in automatic transmissions and other types of geared drives operating under relatively high loads at high speeds where minute tooth errors or deflections under load present noise and wear problems.

How the New Process Works

Internal gears can be crown shaved by the new Red Ring method on a recently developed Red Ring Model GCR internal gear shaving machine. The process, Figure 1, makes use of a specially developed rotary gear shaving cutter and new plunge-cut in-feed techniques.

To crown shave an internal gear, Figure 2, it is mounted on the workhead of a conventional Model GCR internal gear shaving machine. Then the cutter is meshed with the gear and hand-fed against a stop to position the cutter in correct axial location with the gear.

The shaving machine workhead is then rotated with the cutter in mesh with the work. The

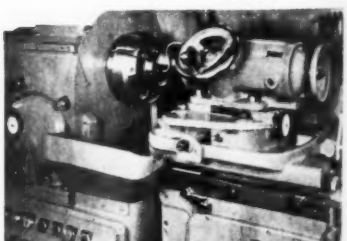


Fig. 2. A closeup view of a Model GCR Red Ring internal rotary gear-shaving machine as set up to produce crowned tooth forms.

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CIRCLE INFORM-A-GRAM KEY NO. 1281

cutter is fed up to depth in predetermined increments with no cutter reciprocation. This is known as plunge-cut in-feed and permits the cutter to form a crowned tooth surface while simultaneously finishing the gear tooth surfaces to provide uniformity and accuracy.

The rotary shaving cutter used in the new Red Ring internal gear crown shaving process is slightly wider than the gear teeth being shaved.

OFFENSIVE COOLANT ODORS CONTROLLED

One of metalworking's oldest and most annoying problems, the offensive odors caused by rancid water soluble coolants, has been solved by the Johnson's Wax Company. The company has compounded a new water soluble cutting fluid, called TL-131, which will not cause foul coolant odors to occur for two full months. This length of time will carry the average shop through the hot, humid summer days when coolant odors are most widespread.

The metalworking industry has lost large sums of money in decreased efficiency of workers due to foul smelling coolants and valuable man hours in the cleaning of equipment to combat the offensive odors. In addition many gallons of costly coolant are dumped each year because they have turned sour.

This new coolant has been tested in the field for the past year with results that warrant placing on it a two month guarantee that it will be free of offensive odors for that period of time.

TL-131 is used in the same way as any conventional water soluble coolant. The only condition is that the machine should be cleaned before recharging with TL-131. One of the advantages is that this coolant does not require the use of irritating formaldehyde or bactericides before it is placed in the machine.

The foul smell found in metalworking shops is called "Monday morning odor". This is actually hydrogen sulfide gas that has been released by bacteria in the machines. The bacteria live and multiply in the bottom of the coolant sump, along coolant pipes, and in the inaccessible corners of the machines.

Bacteria live primarily upon decaying organic matter such as the nourishing substance found in all animal and vegetable cells. TL-131 is all chemical in composition and does not contain any fats or vegetable matter for bacteria to breed in.

This photomicrograph is a 500 time enlargement of the bacteria that cause "Monday morning odors". The foul coolant odor is actually hydrogen sulfide gas given off by these bacteria as they decay organic material contained in the average water soluble coolant.

Hammond OF KALAMAZOO
GOOD MACHINERY SINCE '82

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For Solid Carbide Tools

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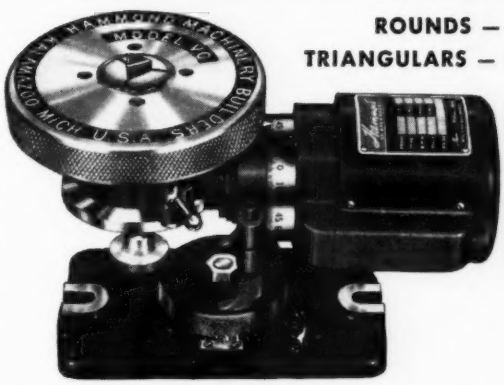
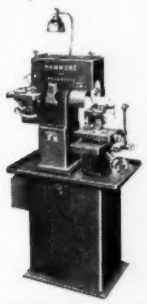


MODEL VC, Style M Motorized Solid Carbide Insert Grinding Fixture. Style H, without motor also available. Write for Bulletin No. 235.



HAMMOND MODEL CB-77 CHIP BREAKER AND DIAMOND FINISHING GRINDER can be supplied with both the standard Any Angle Vise and the Model VC Solid Carbide Insert Grinding Fixture.

THE Hammond Solid Carbide Insert Grinding Fixture pays for itself in a few weeks. Offers a fast, economical and accurate means of grinding chip breaker grooves in round, square, triangular and rectangular shapes and for rough and finish grinding of dull and damaged carbide inserts. Motorized Style M with lug base can be mounted on most tool and surface grinders and Hammond CB-76, CB-77 and CB-77W Chip Breaker Grinders.

BUILDERS OF AMERICA'S MOST COMPLETE LINE OF CARBIDE TOOL GRINDERS

Hammond Machinery Builders INC

1631 DOUGLAS AVENUE • KALAMAZOO, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1291

. . . Materials Handling, from page 111

engineers found a way to do this on a Delta 17" drill press instead of using a turret lathe. By using the drill press, the company has increased production some 100%.

A two-jaw, self-centering vise was adapted as a drill jig. The tool holder, designed by the company, holds two cutting tools — one for counterboring and the other for facing the seat. The tool holder shank fits into the drill chuck.

In the operation, the jaw vise is opened to receive the part placed in the fixture. A plate, which keeps the part square in place, is inserted in the fixture. By tightening a clamp, the part to be worked is brought up against the plate. Then the vise is closed, and the operator brings the cutting tools down and into the work.

Previously, when this counterboring and facing was performed on the turret lathe, it was possible to produce only 40 pieces an hour. With the new method, the company now maintains a production rate of 80 pieces an hour.

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CIRCLE INFORM-A-GRAM KEY NO. 1301

SECOND COMPUTER SCHOLARSHIP PROGRAM IS SCHEDULED

To provide a "meeting of minds" between tomorrow's technologists and the electronic "brains" behind America's new industrial revolution, the ElectroData Corporation of Pasadena, California, has announced its second annual University Scholarship Program in computers to be held June 7 through September 2, 1955.

Selected students from leading universities will take the 10-week course at the company's Pasadena headquarters. The course will comprise training in the structure and operation of digital computers, practical numerical analysis, the theory of programming and coding, industrial computer applications, and management of computer companies.

Any student interested in this financial aid program should check with their department heads and submit applications to Dr. Paul Borck, ElectroData Corporation, 717 North Lake Ave., Pasadena, Calif. by April 15, 1955.

NSMPA ANNOUNCES CONVENTION

"Management Problems" will be the theme of the 1955 Annual Convention of the National Screw Machine Products Association. This year's convention will be held at the Statler Hotel, Buffalo, N. Y., May 4 through May 7. The Association represents 280 manufacturers of screw machine products located in this country, Canada, and Australia. This group accounts for 70% of the total national production.

Special honor will be bestowed upon companies celebrating 50th and 75th anniversary years. Companies to be so honored at the dinner and reception will include the Curtis Screw Company of Buffalo, (50 years); Fischer Special Manufacturing Company of Cincinnati (50 years); and George W. Moore, Inc., of Waltham, Mass. (75 years).

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FASTER GRINDING!

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Model JA
50,000 R.P.M.
$42.00
IN U.S.A.

Weight 12 ounces; length 6¾ inches; chuck size ⅛ inch. Wheel guard removed for better illustration.

The RPM's stay up while grinding . . . not only when the grinder runs idle. That means better work—longer wheel life.

High speed grinding with small wheels was a Madison-Kipp development of the late twenties. It was born out of a pressing need in our tool room. Because tool room grinding problems are universal, we believe it will pay you to utilize Kipp grinders in your tool room as generally as we do in our own.

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Use them as Standards . . . There's a size and type to fit your most rigid requirements. Immediate Delivery on Standards . . . Standards can be modified to suit your application.

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2421 WOLCOTT ST. DETROIT 20, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1312

Carbide Tooled "Cat-Head" Steps up Machine Production

Floor-to-floor time for machining cast iron automatic transmission retainers was recently slashed from 15 to 4 minutes by switching from conventional turret tooling to a special cat-head, shown in illustration, utilizing standard tungsten carbide tools and blanks.

This interesting operation consists of turning, facing, boring, and chamfering the cast iron workpiece on a 20 hp, No. 4-A heavy-duty Warner & Swasey turret lathe.

With the former tooling, several special form tool cutters and five stations of the turret were used. To effect a tool change required 1½ hours. Time required with this tooling held up subsequent operations.

Now, with six modified Kennametal Style-C tools and five standard tool blanks — all Grade K6, machining is done in one pass. Two cat-heads are used — while one is in the machine, the other is in the toolroom being reground and reset. In this way machine downtime is reduced to a minimum. Approximately 500 castings are machined per grind. Feed is 0.011" per revolution at 167 rpm, depth of cut is 1/8" to 3/16".

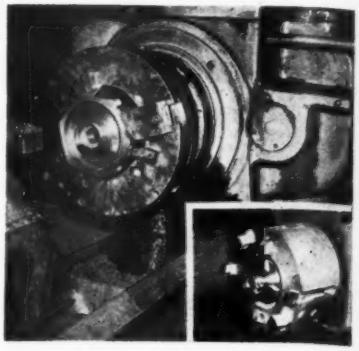


Photo courtesy Kennametal Inc.

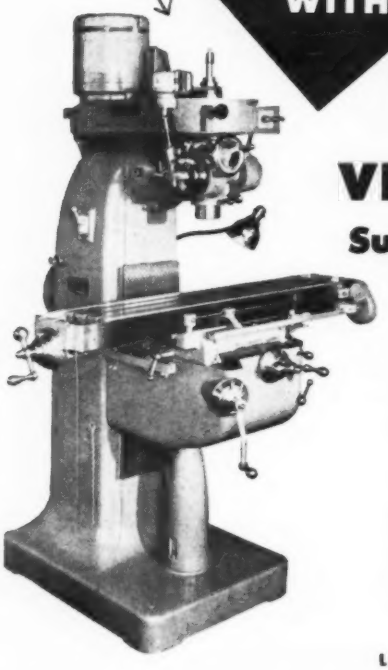
Production Advantages are Numerous — Some advantages of this new cat-head tooling over the formerly-used method are:

1. Requires only slight modification of standard Style-C tool and tips
2. Eliminates fatigue factor — no indexing of turret
3. Minimizes tool changing downtime
4. Reduces scrap due to improper turret tool setting

Rough and finish facing of the workpieces is also performed in one pass using two Kennametal Style-AL tools in the cross slide — one for roughing and one for finishing.

Thus, by reducing floor-to-floor time for this operation to less than 1/3 of that required previously, retooling with standard carbide tools helped to put this job on a production basis.

Again Index
STEPS FAR OUT IN FRONT WITH the New
SUPER 55
VERTICAL MILL
Super Power, Capacity
Rigidity, Precision



Always in the Lead through constant improvements, Index announces this outstanding machine that will give you super performance in your BORING, MILLING and DRILLING operations— 1½ H. P. Head—New spindle brake, Dynamically Balanced Cast Iron Pulleys and Drive System give 50% more capacity. Many more advantages. Get the facts. Write for Literature today.

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INDEX MACHINE CO.
541 N. MECHANIC STREET JACKSON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1321

Kolb Jig Borer

Positioning a workpiece to within .000125" takes only a few seconds on the Kolb Jig Borer. It's fast because of rapid traverse with adjustable stops. It's accurate because of an excellent optical system made by Leitz, one of Germany's best optical manufacturers. Convenient push-button control provides preselection of 18 feeds and 36 speeds. Electro-hydraulic clamping is

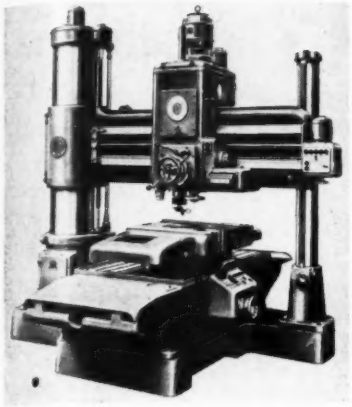


Photo courtesy Cosa Corp.

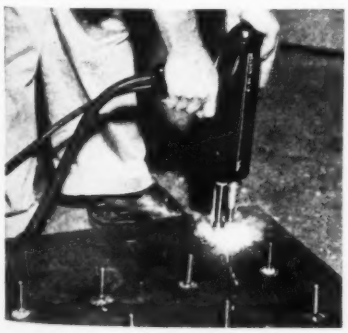
shock-free and distortion-free — does not impair accuracy. Therefore, reading accuracy equals positioning accuracy. Signal lights indicate if head and table are clamped or unclamped. An excellent machine for drilling, boring, reaming, tapping and milling as well as precision measuring.

Optical system has a magnification of 1:100 — 5″ on the focussing screen is equivalent to a movement of 0.05″ along the coordinate. Working surface of table 69″ x 39″, clearance between columns 73″, maximum distance between spindle and table 40″.

Welding Gun Improves Stud Welding Technique

A new and more versatile stud welding gun that reflects engineering experience gleaned from 14 countries, where this popular end-welding technique is in general use, has been introduced by Nelson Stud Welding Division of Gregory Industries, Inc.

The new streamlined gun marks the first comprehensive design change in the Nelson stud welding equipment during the past 10 years. It has a swept-back handle through which the cables enter a steel barrel extending through the plastic body. The body design eliminates the former side cable loop, thereby simplifing accurate stud alignment on the workpiece.



Reduction in the number of electrical connections from three to one has made for increased operating efficiency and simplified maintenance.

Two sizes of guns will be built, one for welding studs with diameters up to ½″ and the other from 10-gage up to 1″ and greater.

A number of factors which contribute to the increased versatility of the new gun are: new design accommodates a greater range of stud length without changing adaptors or other accessories; arc length can be adjusted without disassembly; and new coil design offers greater lifting power and improved efficiency.

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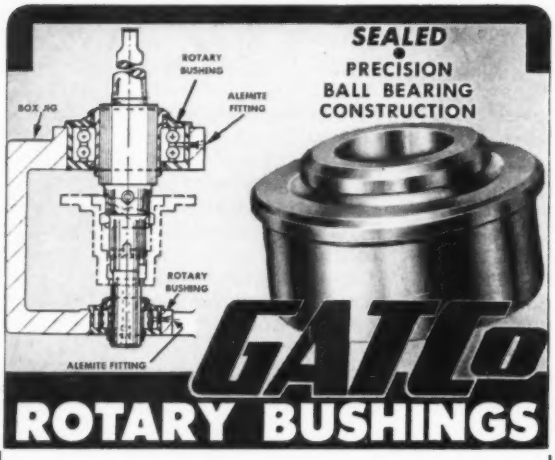
CIRCLE INFORM-A-GRAM KEY NO. 1331



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CIRCLE INFORM-A-GRAM KEY NO. 1341

Tough grinding jobs?

Check Vulcanaire high speed precision grinding heads!

Grinding circular slot using Vulcan's Rotary Table and Magnetic chuck.

Many seemingly impossible grinding problems have been solved by adapting Vulcanaire to standard machines or by using one of Vulcan's specially designed machines.

On Surface Grinders, merely remove wheel and guard, clamp vertical or horizontal adaptor to machine as illustrated. No belts necessary. For instance, Vulcanaire used in connection with Vulcan's Rotary Table for Surface Grinders permits the grinding of a circular slot.

Vertical adaptor for Surface Grinders. Grinding small slots

Adaptors are in stock to fit the spindle of Vertical Milling Machines for grinding contours, holes and slots.

On Internal Grinding Machines Vulcanaire's infinitely controlled speeds furnish the correct surface cutting speed resulting in faster production and micro finish. The adaptor sleeve fits into present housing.

Applied to Jig Boring Machines, Vulcanaire is liked by leading precision manufacturers because its accuracy is guaranteed, producing Vulcanaire jig grinding of large and small parts.

Horizontal application. Grinding a shoulder Punch.

Send us a blue print on your toughest grinding problem. Recommendations and sketches will be returned to you — no obligation.

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VULCAN TOOL CO.

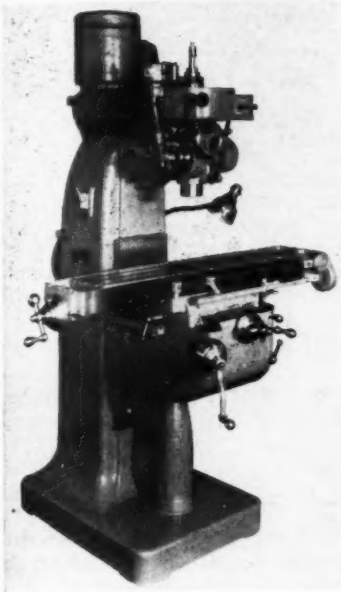
10 PRITZ STREET • DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1342

New Vertical Mill Features More Power & Capacity

Outstanding possibilities for boring, milling, and drilling operations are built into the new Super 55 vertical milling machine developed by The Index Machine Company. It features a new conception in power, capacity, weight, and rigidity.

It offers a 1½ or optional 2 hp head with heavy-duty motor affording 50% or more capacity than previously available. The increased horsepower and dynamically balanced cast iron pulleys and drive system make possible the improved production capacity. The flywheel effect of cast iron pulleys greatly increases the rigidity of the spindle.



A new improved system of table gibs allows the table clamping mechanism to be brought to the front side of the saddle and still retain the advantage of having the rod trays adjacent to the fixed table slideway. Newly designed spindle brake increases productivity. More weight in the column, heavier ribbed column, heavier knee and heavier saddle are a few of the additional outstanding features.

Capacity, ⅛" to 1½" end mills in tool steel, 2" or more in milder steels or cast iron. Table size 40" x 9" or 46" x 9". Heavy-duty silent V-Belt drive. Height overall 76".

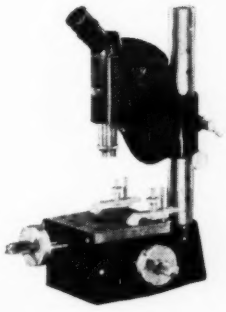
3 EASY WAYS to boost production of precision parts

1 Bausch & Lomb BENCH COMPARATOR

Save inspection costs: no expensive holding fixtures needed for most work. Save time: no complicated set-up. Easy operation quickly provides vivid screen image, reveals costly production errors. Micrometer stage (optional) reads to .0001".

2 Bausch & Lomb CONTOUR MEASURING PROJECTOR

Quickly, easily shows sharp silhouettes or detailed surface views on 18" screen . . . for inspection, comparison, or highest precision measurements. Linear readings to .0001"; angular, to 1 minute of arc.



3 Bausch & Lomb TOOLMAKERS' MICROSCOPE

Quickly measures or inspects opaque or transparent objects of any contour. Linear readings to .0001"; angular, to 1 minute of arc.

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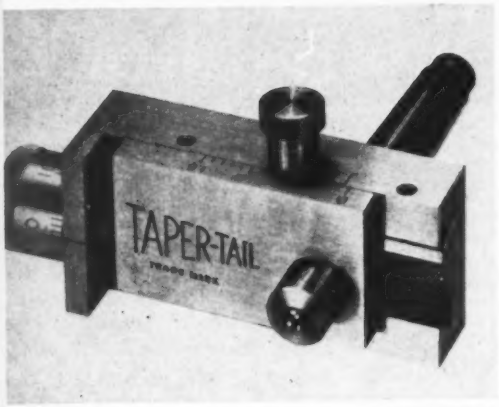
BAUSCH & LOMB SINCE B&L 1853

Quality Control INSTRUMENTS

CIRCLE INFORM-A-GRAM KEY NO. 1351

PROGRESS

NEW DEVELOPMENTS • IMPROVEMENTS • COST AND TIME SAVERS



"TAPER-TAIL" . . .

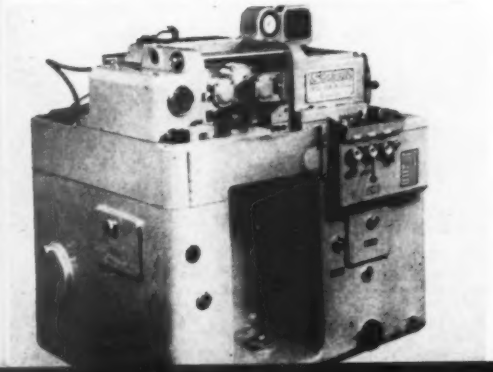
Tapers up to 3" length between centers can be cut with the new lathe tailstock attachment, the "Taper-Tail," without disturbing straight work alignment or disconnecting the cross carriage. The unit by L. A. Fitzer Tool Works, Villa Park, Ill., is inserted in the tailstock in place of the center used for straight work.
Inform-A-Gram No. A1.

BEARING LUBE . . .

A new oil fog type bearing lubrication unit by C. A. Norgren Co., Englewood, Colo., uses twin lubrication heads which may be used simultaneously or individually, depending on fog requirements. Automatic controls provide signals against depletion of oil, failure of air supply, and excessive pressure. For full information ask for Form 492-A, or—
Inform-A-Gram No. A2.

DISC GRINDER . . .

The "Neeco-2-Twenty" abrasive coated cloth disc grinder is a 20" dia double disc machine developed by New Era Engineering Co., 458 W. 29 St., Chicago 16, Ill. Operating at the fast speed of more than 18,000′ per min, the machine is extremely flexible for rapid material removal and fine finish. Get information from the manufacturer, or — **Circle No. A3.**

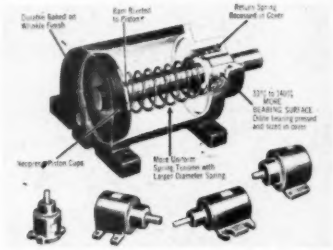


FORM GENERATOR . . .

The Steinle form generating machine is designed for high speed production of all types of screw threads, deep worms, multiple threads, and tapered heads. Get a descriptive brochure from The Steinle Machine Co., New Britain, Conn., or—**Circle No. A4.**

AIR CYLINDERS . . .

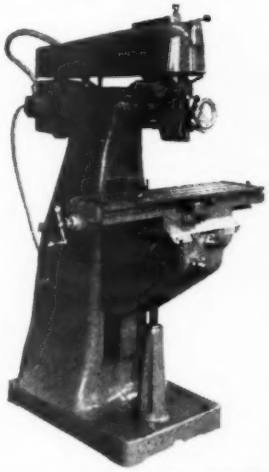
Twenty-six newly perfected single-acting air cylinder models are announced by Mead Specialties Co., 4114 N. Knox Ave., Chicago 41. Improvements made in the new models include increas-



ed bearing surfaces, larger diameter return springs, Oilite ram bearings, and use of full-floating Hycar synthetic rubber piston cups. Bulletin AC-93 illustrates the improvements. **No. A5.**

VERTICAL MILLER . . .

Exclusive features of the new power feed head vertical milling machine by U.S. Burke Machine Tool Div'n, Brotherton Rd., Cincinnati 27, Ohio, include infinitely variable feed from 0.002" to 0.008" per revolution, 5½" of power quill travel, internally locked completely enclosed hard



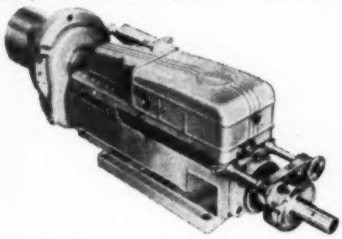
chrome plated quill, 800 lbs of "down thrust", coarse and fine hand feeds as well as power feed, variable positioning of coarse feed lever and quill lock handle, and variability of feed rate while machine is in operation. It is available with or without power table feed.
Circle Inform-A-Gram No. A6.

ON PARADE

Mail FREE Inform-A-Gram Card for MORE Details.

"AIR-OIL-MATIC" DRILLS . . .

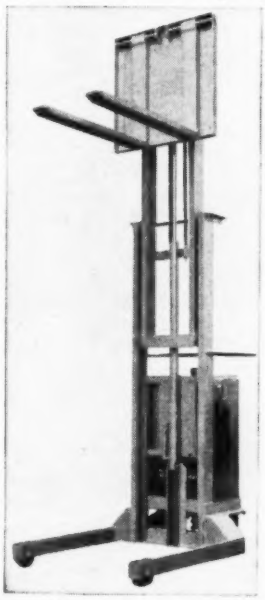
Parts are interchangeable on the two — one oil powered, one air powered—hydraulically controlled "Air-Oil-Matic" drilling units by Morris Machine Tool Co., Cincinnati 3, Ohio. The ver-



satile units can be mounted vertically, angularly, or horizontally for a wide range of drilling, tapping, reaming, chamfering, spot facing, centering, and related operations and have adjustable feed rate, feed stroke, and quick approach rate. A new catalog is available. **Circle No. A7.**

NEW "WORKLIFTER" . . .

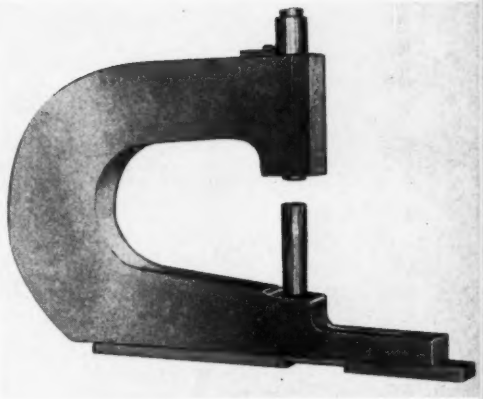
A battery-hydraulic "Worklifter" with telescoping frame has been developed by Economy Engineering Co., 4511 W. Lake St., Chicago 24, Ill. Capacity of



Model WLFT 96 is 1,000 lbs and maximum fork lift is 10'4". Push button controls are mounted on a 12' cord and held by take-up reel for operation from the spot most convenient to the operator. **Circle Inform-A-Gram No. A8.**

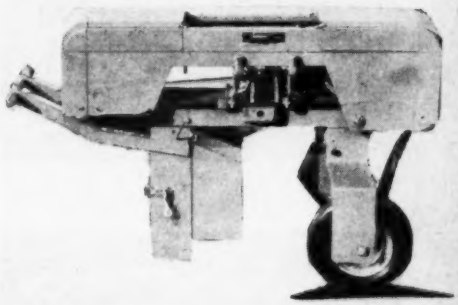
PIERCING UNITS . . .

The new series of aircraft type piercing units by the Toolset Div'n of General Riveters, Inc., 785 Hertel Ave., Buffalo 7, N. Y., feature Toolset top and bottom punch guides, interchangeability of many parts on the various models, and compact size. Holes up to 5/16" dia on 3/4" centers can be punched with the unit. **Circle No. A9.**



PORTABLE SAW . . .

Hand cutting of iron, steel, pipe, conduits, etc., is eliminated when you roll the new Model M portable band saw to the stock to be cut. The unit is of all steel construction, is mounted on 12" rubber tired wheels, and is comparatively light weight. The Johnson Mfg. Corp., Albion, Mich., will supply a complete catalog, or—
Inform-A-Gram No. A10.

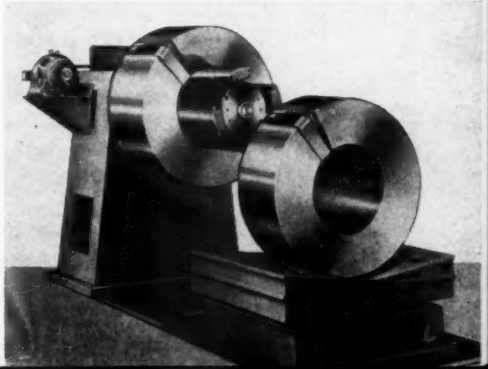


WIRE MACHINE . . .

Lewis 2-C wire straightening and cutting machines feature enclosed straightener arbor guard, heavy section V-belts with large pulleys, rigid straightener arbor support brackets for minimum vibration, and higher speed five die straightener arbor mounted on ball bearings. For full data, contact The Lewis Machine Co., Dep't 6F, 3441 E. 76 St., Cleveland 27, or—
Inform-A-Gram No. A11.

COIL HANDLER . . .

The new combination "Coil Lift" and "Decoiling Reel" for coils up to 20 tons is by Dahlstom Machine Works, Inc., 3225 W. Belmont Ave., Chicago 41, Ill. Units are designed to meet individual requirements. Ask for details. **Circle No. A12.**



Durably made of quality stock . . . simple and easy to attach . . . can be fitted to any die in 10 to 15 minutes. Adaptable to blanking, progressive or compound dies and can be used on strippers 5/16 inch thick and up. Works well on either right or left hand feeds—or with light or heavy material. Provides long, trouble-free performance.

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Automatic Stop individually packed with Trip Spring and Mounting Screws ..... **$2.50 each**
Primary Stop ..... **$6.00 doz.**
(Discount for quantity orders)

Automatic Stop				
Cat. No.	A	B	C	D
9-11-6	3/16"	5"	5/8"	3"
9-21-6	1/4"	6"	3/4"	4"

Specify right or left hand

Primary Stop			
Cat. No.	A	B	C
9-31-6	1/16"	3/8"	2 3/8"
9-41-6	3/32"	3/8"	2 3/8"
9-51-6	1/8"	3/8"	2 3/8"

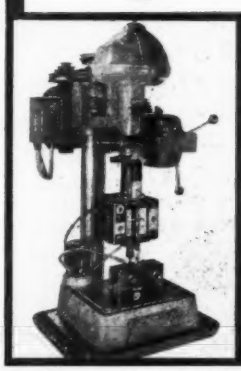
For immediate delivery, specify size and mail orders to
DANLY MACHINE SPECIALTIES, INC.
2100 South Laramie Avenue, Chicago 50, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1381

Commander
LEAD-MATIC *Tapper*
Automatic Tapper with Lead Screw
FOR HIGH PRODUCTION
PRECISION TAPPING

- Precision Ground Lead Screws Assure Finest Threads
- Electrically Controlled Cycle or Jog Tapping Action
- Hand, Foot or Fixture Switch Control
- Easily Adapted to Any Drill Press
- Range #0 to ¾"

Built for high production tapping . . . precision or otherwise, the Commander Lead-Matic Tapper makes any drill press a precision tapping unit, even with inexperienced operators. Electric control of Cycle or Jog tapping action provides versatility to handle any job . . . automatic tap reversal eliminates drill press motor reversing and speeds tapping. Compact, ruggedly built, easy to operate, the Commander Lead-Matic Tapper will cut your tapping costs and reduce rejects to a minimum.



Write for illustrated circular and name of nearest Distributor.
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When New Molds Stick use **IMS**
SILICONE FLUID
For Better Tool and Die Lubrication!

Shorten costly break-in periods! Simply spray on this perfect parting agent from self-dispensing aerosol! Useful too in PATTERN MAKING — releases patterns from master molds with minimum surface defects. Remember . . .

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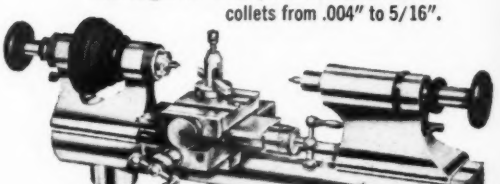
Twenty-three models for all types of work. 4" swing, Bed Length 12" or 18"; over 100 stock sizes of collets from .004" to 5/16".

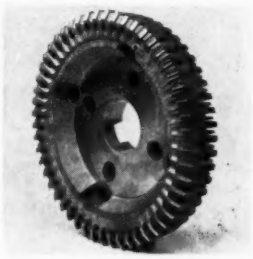


Send for Catalog M describing Lathes for tool work, second operations; turrets and full line of accessories.

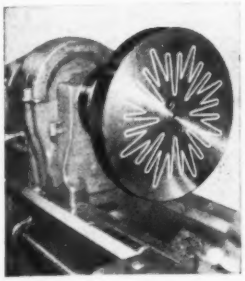
LOUIS LEVIN & SON, INC., 3610 S. BROADWAY, LOS ANGELES 7, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1384

The "Mim" Gauge gives the actual size of the thread and the pitch diameter without the use of calculations or reference tables. It determines interchange ability of the thread and indicates whether it is within standard limits. Metronic Institute, Box 221, Burburbank, Calif. **Circle No. A13.**

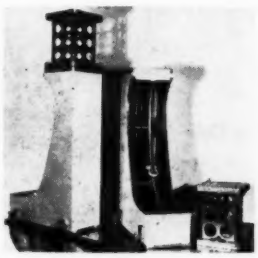


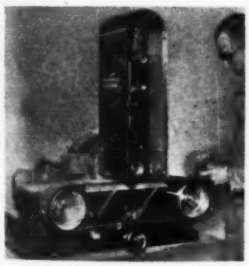
The Extra-Close-Bladed, high feed rate "Shear Clear" face mill by The Ingersoll Milling Machine Co., Rockford, Ill., has five carbide-tipped blades for every inch of diameter and is providing tool life increases from 75% to 100% on production jobs. It is valuable for milling cast iron at high feeds.
Inform-A-Gram No. A14.



A New Electro Magnetic Chuck has been announced by Magnetic Holding Devices, 2034 E. 22 St., Cleveland, for special application on lathes, grinding machines, and special machines. An important feature is its greater and more even distribution of magnetism on the face due to the magnetic pattern on the face called "Crow Foot."
Inform-A-Gram No. A15.

Height Blocks and Angle Plates with heat-treated, alloyed aluminum bodies and hardened steel tops and bottoms are now manufactured by Machine Products Corp., 6771 E. McNichols Rd., Detroit 12, Mich. Both the blocks and the plates can be used singly or in combination.
Inform-A-Gram No. A16.





A Small Conveyorized all-purpose abrasive belt machine has been developed by The Curtis Machine Corp., Jamestown, N. Y. The bench type Model 304C and grind, polish, and deburr all types of materials on its 4" wide belt. Multiple grinding heads for rough to finish grinding operations are also available.
Inform-A-Gram No. A17.

"Grip-Tip" Centers consist of holder and replaceable carbide tip. The tool steel holder is available in several standard shank tapers and solid carbide tips in ¼" and ½" dia, accurate to 0.0005". Tips are inserted or removed by turning a screw on the holder. An adjustable screw in the shank positions the depth of the tips in the holders. Detroit Reamer & Tool Co., 2830 E. Seven Mile Rd., Detroit 34, Mich.

Inform-A-Gram No. A18.

Costs
nothing cuts like a diamond
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FASTER CUTTING—
Diamonds save valuable time
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choose diamonds for . . .
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See the construction of this newly perfected single-acting Mead ®Air Clamp cylinder. Compare with others—you'll switch to Mead! Now all perfected single-acting Air Clamps use less air—to further cut your costs feeding, holding, ejecting, finished pieces. They are in stock at your nearest Mead Man for immediate delivery.
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Use CROBALT cast alloy tools!

CROBALT cast alloy cutting tools outwear and outproduce HSS . . . withstand shock and vibration far better than carbides . . . give 15% to 35% more pieces per grind than other cast alloys! They've been proven through 23 years in the largest metalworking plants; and today they're better than ever. Try them and see!

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describes the conditions where cast alloy tools are BEST — and tells how to use them to full advantage. In it, you may find the way to higher production at lower cost. Write for *Bulletin 101*.

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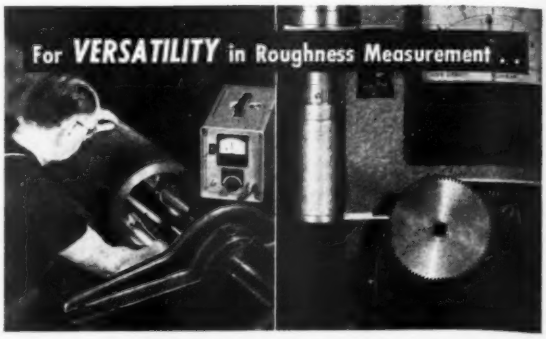

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With the Profilometer, you can quickly measure the microinch roughness of ID's of *any* size from 5/64" to flat — OD's of *any* size from 1/32" to flat, and from .010" to *several feet* in length — gear teeth as small as 48 D. P. — internal grooves and tapers — ½" holes to 24" depth — and practically *all other* surfaces.

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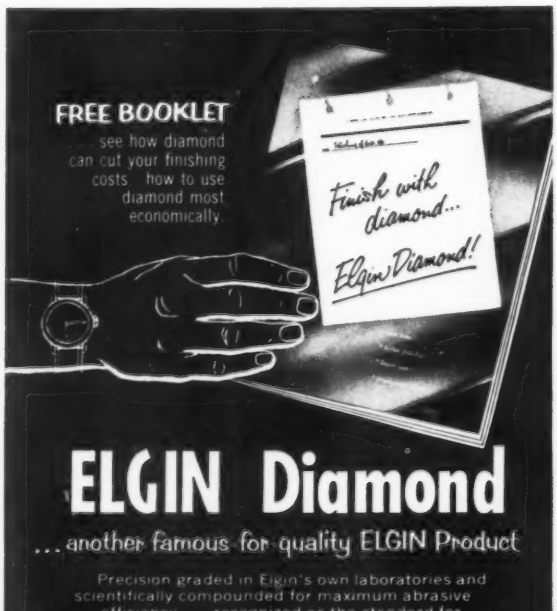
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CIRCLE INFORM-A-GRAM KEY NO. 1403

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ARC-FIT TWIN-NOTCH

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PERFECT "T" Joints for welding or brazing.

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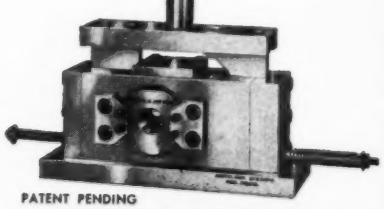
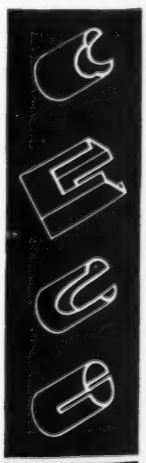
INTERCHANGEABLE Punches and dies up to 2¾" O.D. pipe or tube for STANDARD TWIN NOTCH. (Special units available up to 3" O.D.)

SEND FOR DESCRIPTIVE LITERATURE



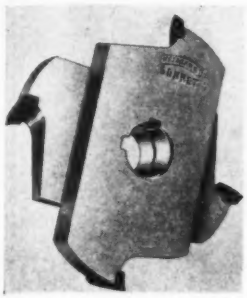
PATENT PENDING



VOGEL TOOL AND DIE CORPORATION
1817 N. 32nd Ave. Melrose Park, Illinois
FIllmore 5-0160

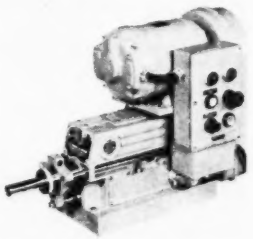
CIRCLE INFORM-A-GRAM KEY NO. 1404

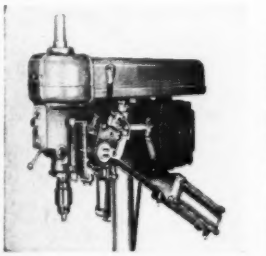
Automatic Locking and Unlocking is the feature of the new Roller Clutch Expanding Mandrels by Young Arbor Co., 1311 E. 125 St., Cleveland 10. Based on the overrunning clutch principle, the mandrels function efficiently without the use of keys, wrenches, air or hydraulic devices. Concentricity is guaranteed to 0.0004". Literature is available.
Inform-A-Gram No. A19.



Standard Stagger-Tooth Side Milling Cutters and interlocking side or straddle mills in various sizes were recently added to the "Helicarb" line of helical carbide milling cutters manufactured by Sonnet Tool & Mfg. Co., 576 N. Prairie St., Hawthorne, Calif. Four-tooth design permits adequate chip load on machines without high speed spindles and fast table feeds.
Inform-A-Gram No. A20.

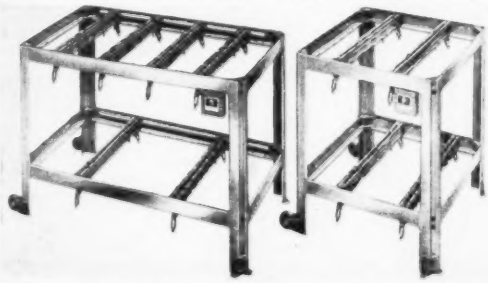
Automatic Drilling. A self-contained hydraulic power unit for drilling, reaming, counterboring, spot facing, and chamfering — the Drillmation Model 500 — has been developed by Drillmation Co., 21509 John R St., Hazel Park, Mich. Features include enclosed electrical controls, maximum thrust control, positive and variable feed control, micro depth control, and emergency quill return. A new catalog is available from the manufacturer. or —**No. A21.**





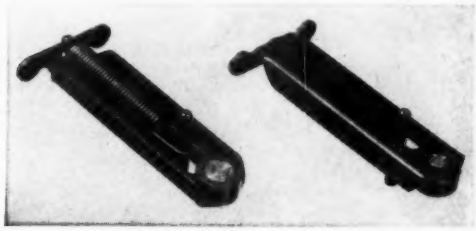
The New "Air Feed" by The Walker-Turner Div'n of The Kearney-Trecker Corp., Plainfield, N. J., will fit the heads of W-T type drill presses with up to 6" spindle travel, for checking and slowing-down the spindle at several points as well as at the drill's break-through point.
Inform-A-Gram No. A22.

A Machine and Assembly Fixture Stand featuring universal adjustment is introduced by Sturdi-Bilt Steel Products, Inc., 2501 Peterson Ave., Chicago. Patented



vibration-free "Tension Bolting" locks the stand together for permanent rigidity. A "Powr-Panl" accessory gives 1 hp remote control switching. **Circle No. A23.**

FOR POSITIVE STOCK ALIGNMENT
IN PROGRESSIVE DIES



Amcor Roller Stock Pushers

SPEED UP PRODUCTION with precision-made AMCOR Roller Stock Pushers. Easy, smooth stock feeding, without buckling, assures more production with less operator fatigue.

SAVE MONEY. AMCOR Roller Stock Pushers sell for just a fraction of what hand-made bench models cost to make.

SIMPLE TO INSTALL. Requires only a slot milled in the stripper plate, and a hole drilled in the die block and stripper plate. Tracing template for slot and hole location is supplied. When die is sharpened, no refitting is necessary.

The AMCOR Roller Stock Pusher is quickly adaptable to any work specifications. Distributors throughout the country stock a complete line of nine models to fit all production needs.

Write us for complete information

APPLIED MECHANICS CORPORATION
460 LYON, N. E. GRAND RAPIDS, MICHIGAN
CIRCLE INFORM-A-GRAM KEY NO. 1411

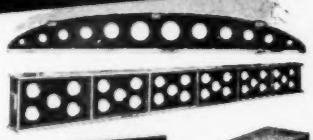
CHOOSE CHALLENGE . . .
and be precision sure!

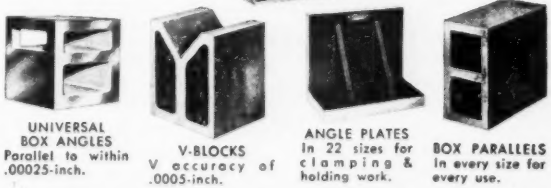
CHALLENGE SURFACE PLATES

New! Clovis Black Granite
Rated Class A. Surface accuracy guaranteed. 24 sizes.

Special Analysis Semi-Steel
Fine grain. Precision ground or hand scraped.

STRAIGHT EDGES
for lathe bed ways. PARALLEL STRAIGHT EDGES for inspection of alignment.





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Parallel to within .00025-inch.

V-BLOCKS
V accuracy of .0005-inch.

ANGLE PLATES
In 22 sizes for clamping & holding work.

BOX PARALLELS
In every size for every use.

782

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THE CHALLENGE MACHINERY COMPANY
Office, Factories and Show Room:
GRAND HAVEN, MICHIGAN
DEALERS IN ALL PRINCIPAL CITIES

CIRCLE INFORM-A-GRAM KEY NO. 1412

TOGGLE CADDY CLAMPS

● HEAVIER LINKS AND HANDLE
Pipe extension handle cannot damage clamp.

● HEAVIER FRAME
Cannot spring or bend under maximum load.

● ALL WELDED CONSTRUCTION
Outlasts stamped type clamps 5-1.

● EXTRA LARGE PIVOT PINS
300% more bearing surface than other clamps.

COMPLETE CATALOG ON REQUEST

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CIRCLE INFORM-A-GRAM KEY NO. 1421

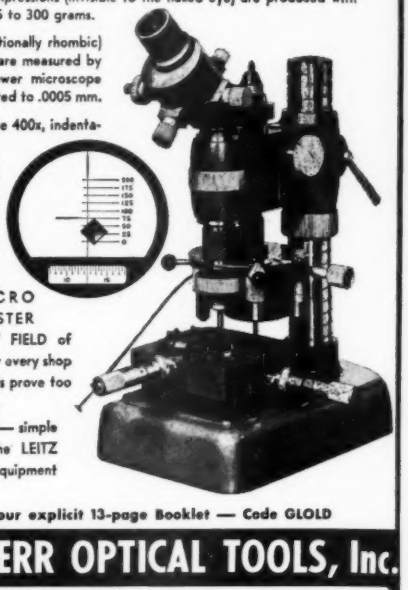
ADVANCE IN HARDNESS TESTING with the NEW LEITZ MICRO HARDNESS TESTER

Even the most delicate and highly finished parts or tools may be tested for hardness WITHOUT DAMAGING or DEFORMING THE FINEST FINISH.

The diamond impressions (invisible to the naked eye) are produced with loads of only 15 to 300 grams.

The pyramid (or optionally rhombic) shaped impressions are measured by means of a 400-power microscope with reticule graduated to .0005 mm.

Microscope objective 400x, indentator as well as an extra 100x locating objective are mounted on a common revolving turret for quick indexing on the impression.



The LEITZ MICRO HARDNESS TESTER opens up a NEW FIELD of Hardness Testing for every shop where other methods prove too costly or unsuitable.

A reasonable price — simple operation, make the LEITZ TESTER essential equipment for any shop.

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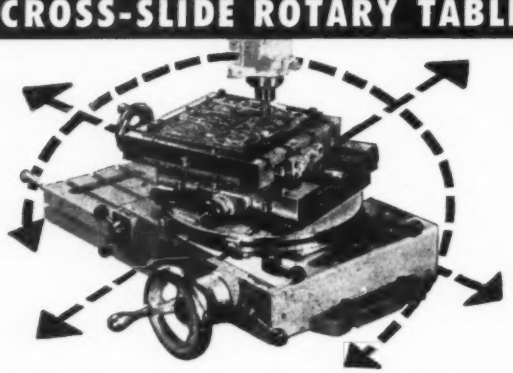
ADVANCE
CROSS-SLIDE ROTARY TABLE



CUT Set-Up Time Cost As Much As 90%*

Make multiple radii and angle milling cuts accurately with only ONE set up! On your standard vertical mill, equipped with ADVANCE Cross-Slide Rotary Table, you can make all such cuts without re-clamping work. Size of radius you can cut is limited only by milling machine table movement. Ideal for molds, dies, patterns, etc.

*Proved by actual on-the-job performance.

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CIRCLE INFORM-A-GRAM KEY NO. 1423

INSERTED BLADE GENESEE
FACING AND COUNTERBORING TOOLS

Interchangeable Pilots

Constant Chip Space Throughout Life of Blades

Standard Sizes 1¼ to 4 Standard with Straight or Morse Taper Shanks

H.S.S.—Carbide Tipped Blades. Save 25% or more over cost of Solid Tools

Consult our Engineering Department on your Inserted Blade Production Tool Problems.
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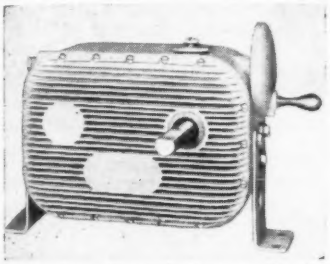
566 HOLLENBECK ST. • ROCHESTER 21, N. Y.
Adjustable Hollow Mills • Facing and Counterboring Tools • Special Production Tools • Since 1907

CIRCLE INFORM-A-GRAM KEY NO. 1424

Tap Extension. A square hole inside the tap-holding end of the Ritmar tap extension transmits driving torque to the square end of the tap, insuring positive tapping and re-

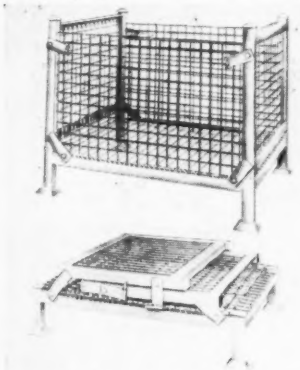
traction action with either right or left hand threads. Sizes from No. 0 are available from Ritmar Corp., 183 New York Ave., Huntington, Long Island, N. Y.
Circle Inform-A-Gram No. A24.

New "Zero-Max" infinitely variable speed reducer is ideal for use on machine tools, conveyors, and pump drives and for other uses requiring a wide infinite speed range



with accurate speed change. It gives full variable speed from zero to ¼ the input speed. Revco Inc., 2 E. Franklin Ave., Minneapolis 4, Minn.
Circle Inform-A-Gram No. A25.

Shipping Containers. Combining the structural strength of the steel tubular rack with the features of the wire mesh container, the Paltier "Folding Pyramid" box is a durable



shipping and stacking unit. Folded units stand 15¾" high. Standard sizes are 40" x 48" x 24" and 32" x 40" x 24", with a two ton capacity. The Paltier Corp., 1701 Kentucky St., Michigan City, Ind.
Circle Inform-A-Gram No. A26.

INTRODUCING Model SV

ALLENAIR Cylinders

WITH BUILT-IN SOLENOID or AIR PILOT OPERATED FOUR-WAY VALVES

ALLENAIR —the low priced quality line

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CYLINDERS. Plain or with built-in valves. Up to 20" of stroke in stock.

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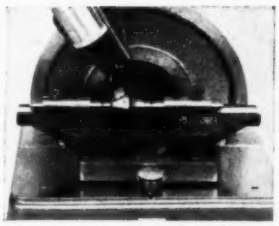
Best Check for
Parallelism...
Squareness...
Angles...

Perkin-Elmer's Optical
ANGLE COMPARATOR



Checking taper angle (above). Checking micrometer for parallelism of anvil and spindle faces, thread runout and frame alignment (above, right).

Simplifies and speeds inspection of parts, even though difficult to approach by other means. Measurements read directly from graduated reticle. Operates entirely on optical principles—no physical contact with part required—precision is independent of the operator.

For descriptive booklet write:
The Perkin-Elmer Corporation, 818 Main Ave., Norwalk, Conn.

PERKIN ELMER

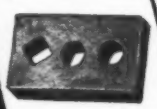
Optical Tooling for the Modernized Machine Shop

CIRCLE INFORM-A-GRAM KEY NO. 1432

METAL DISINTEGRATION

and what it can do for you

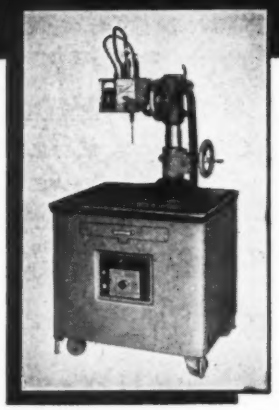
Remove broken taps fast without distortion



Cut any shape hole in cemented carbides

Cut dovetails in hardened dies

Cut oil holes in hardened gears without annealing



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

There's a technical engineer in your area to give you an on-the-spot demonstration in your own plant at your convenience. (NOTE: It is not uncommon to pay for a Metalmaster with just one short demonstration through savings on workpieces.

There's a Metalmaster designed for your operation and priced to fit your needs. For information as to the many uses and benefits Metalmaster can offer you, write today on your company letterhead to:

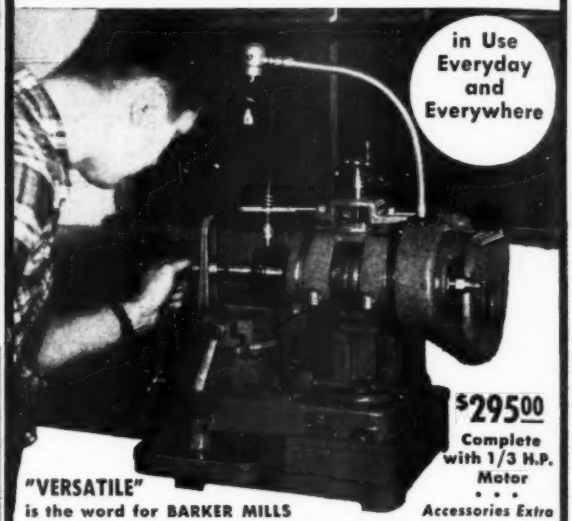
Metalmaster

DIVISION OF CLINTON MACHINE COMPANY

CLINTON, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1441

★ MORE BARKER MILLS in MORE PLANTS on MORE JOBS



"VERSATILE" is the word for **BARKER MILLS**

Tested Design and Unusual Operational Features are Boosting Barker's Popularity with machinists and plant executives by leaps and bounds. More than a thousand in use already in diversified industries and on various machining operations. Satisfaction that prompts repeat orders is one of our strongest claims. Investigate the BARKER before you buy. We know the BARKER MILL can work wonders in your tool room or on your production line.

Write for Details. **BARKER ENGINEERING CO.** 500 GREEN ROAD CLEVELAND 21, OHIO

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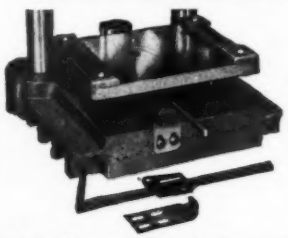
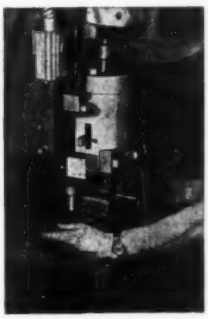
Adjustable Automatic Stock FEED STOP for DIES

Dahlstrom Light Duty AUTOSTOP





No drill jig...
No slotting...
No milling...

$1.75

TO INSTALL: Just drill one 7/32-inch hole, then drill and tap four mounting holes per directions. That's all there is to it!

Trial order **$1.75** each; lots of 12 $1.50 each. State whether for use on compound or progressive dies. *Write for free pamphlet.*

Tested and improved through the years, the Dahlstrom Autostop will save hours of your high priced labor. Adjustable to work with blanking, progressive and compound dies. Mounts on stripper plate in 15 minutes. Handles sheet steel up to 1/16" x 6" or equivalent weight.

***By the makers of the* DAHLSTROM TAP GUIDE**

Branch MANUFACTURING COMPANY

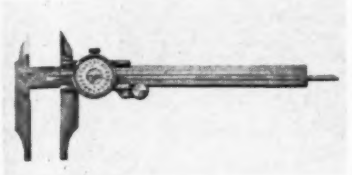
16 Olsen Drive • North Branch • Minnesota

CIRCLE INFORM-A-GRAM KEY NO. 1443

For Top Performance in Tough and Hardened Materials such as heat treated steels, steel forgings, steel castings, etc., Chicago-Latrobe's Type No. 710 heavy duty drills are

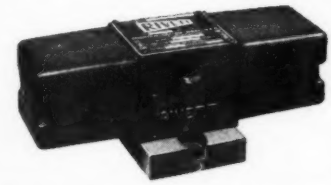
made of high speed steel, quality controlled, with sizes from ⅛" through 1½". Chicago Latrobe, 411 W. Ontario St., Chicago 10, Ill., or—
Circle Inform-A-Gram No. A27.

This Dial Indicating Vernier Caliper reads in thousandths of an inch. Made of stainless steel, it has a full



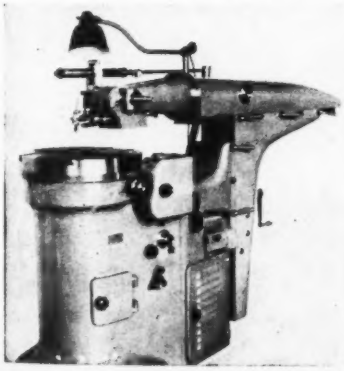
6" measuring capacity and doubles as a depth gage. Inspection Devices Co., 5636 Lake Park Ave., Chicago 37, will supply information, or—
Circle Inform-A-Gram No. A28.

A Solenoid Pilot Valve for automatic control of hydraulic circuits is announced by Rivett Lathe & Grinder, Inc., Brighton 35, Boston, Mass.



Its continuous-duty, shock mounted solenoids provide long life and low power consumption. Catalog 260 gives complete information.
Circle Inform-A-Gram No. A29.

This Circular Dividing Machine is automatic and ideal for production dividing of dials, circular scales, etc. Although of a large capacity of ap-



proximately 40", it will divide small work such as graduated collars. Literature on the new Kesel machine is available from George Scherr Co., Inc., New York, N. Y. **Circle No. A30.**

one source

with years of experience,
proven ability
and adequate facilities
to handle your
complete automation program.

serving industry since 1931

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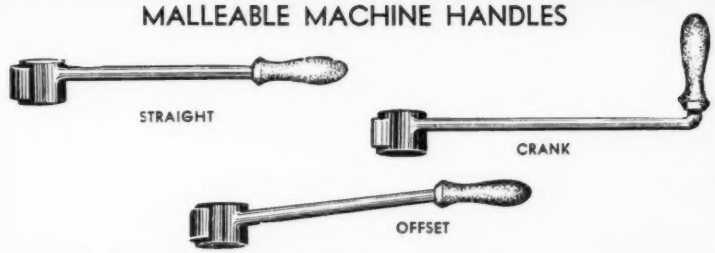
CIRCLE INFORM-A-GRAM KEY NO. 1451

REID QUALITY TOOL-ROOM ACCESSORIES AT MODERATE PRICES!

MALLEABLE MACHINE HANDLES



Made in straight, crank and offset as shown. These are the finest and most complete on the market. Large variety of sizes. Designed to withstand severe usage. Well proportioned and neat in appearance. Finished, ready for use.

Also

The REID Line includes many other accessories and components, including plastic and steel ball handles, cast iron hand knobs, counterbalanced and solid web hand wheels, compression springs, etc.

FREE! NEW 56 pg. CATALOG

REID TOOL SUPPLY CO. Muskegon Heights, Mich.

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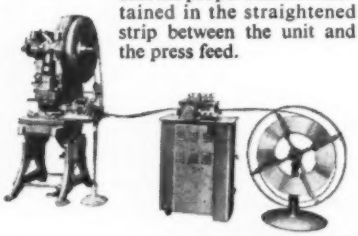
DYKEM STEEL BLUE
Stops Losses
making Dies and Templates
Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.
Write for sample on company letterhead
THE DYKEM COMPANY
2303L North 11th St. • St. Louis 6, Mo.
DYKEM STEEL BLUE
With DYKEM Steel Blue
Without DYKEM Steel Blue

CIRCLE INFORM-A-GRAM KEY NO. 1453

Economy · Dependability

WITTEK
STOCK STRAIGHTENERS

Used in conjunction with a reel stand and automatic feed for punch presses, the Wittek Stock Straightener is a self-contained, motor-driven unit designed for maximum efficiency in the continuous straightening of coiled stock. Standard models handle stock with widths up to 12 inches. An infinitely variable speed drive permits any desired straightening speed so that the proper slack is maintained in the straightened strip between the unit and the press feed.



This typical Wittek automatic production feeding setup includes —Wittek roll feed mounted on the punch press, Wittek stock straightener, and Wittek self-centering reel stand.

5577

Write for full particulars

WITTEK Manufacturing Co.
4323 W. 24th Place • Chicago 23, Illinois

Production Feeding Equipment

CIRCLE INFORM-A-GRAM KEY NO. 1461

DUSTKOP STOPS DUST

DUST COLLECTORS

SAVES INSTALLATION TIME

Stop dust quickly, at lower cost, with Dustkop. Thirty-seven standard models *ready to use* and available from stock. Dustkop conserves floor space, reduces maintenance. Collects almost all types of industrial dusts. Write for descriptive literature.

Also a complete line of Mist Collectors

AGET MANUFACTURING COMPANY
1394 East Church St. • Adrian, Michigan

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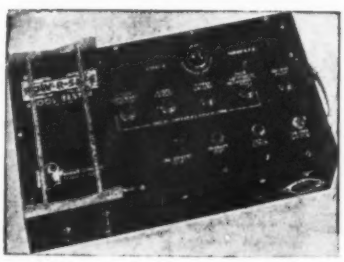
NEW TOOL TESTER

Eliminates Production Delays Due To Faulty Electric Tools and Cords

- Detects presence of short circuits.
- Detects power grounds due to moisture paths, carbon paths, insulation breakdown.
- Detects loose or corroded terminals.
- Checks ground circuit continuity.
- Quickly tests extension cords.
- Single button operation. Takes only 7 seconds.
- Green light flashes to indicate "safe".
- Red light and buzzer indicates "unsafe".
- Pilot light for continuity test.
- Automatic safety stop. Fool-proof.
- Completely portable.



Fendall POW-R-SAFE Tool Testers enable you to quickly detect electrical and mechanical defects in your power tools and cords. Takes only a few seconds to determine whether operating condition is safe or unsafe. Easy to use. Send for details now!

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4513 N. Lincoln Ave. Chicago 25, Ill.

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BALLS

- **All Materials** including carbides; hard cast alloys; stainless, chrome, and high speed steels; ceramics; plastics; synthetic sapphire.
- **All Sizes - Standard and Special** from 1/32" to 6" or larger.
- **All Quantities, Small or Large** from 10 balls to millions.
- **High Precision —** to .000010" on size and sphericity.
- **Engineering Service** at your disposal, upon request.

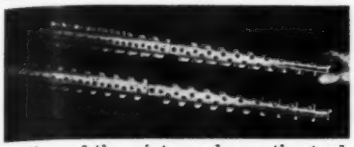
WRITE FOR quotation and descriptive bulletin.

INDUSTRIAL TECTONICS, Inc. ANN ARBOR 7, MICH.

ITI PRECISION BALLS
All Materials — All Sizes
In Large or Small Quantities

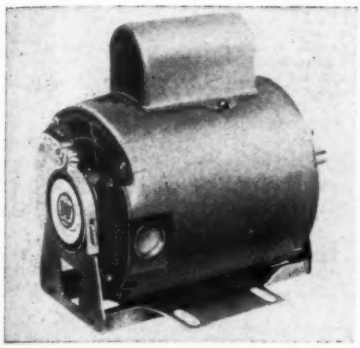
CIRCLE INFORM-A-GRAM KEY NO. 1464

The New Type "Red Ring" inserted-tooth carbide surface broach avoids chatter and cuts tool costs when taking heavy cuts on semi-circular cast iron surfaces. The upper



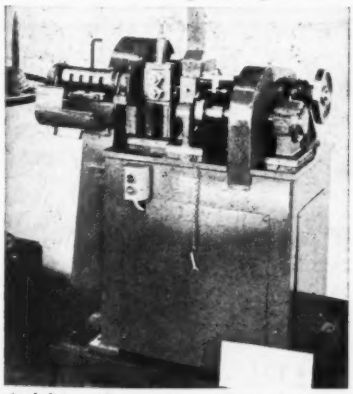
section of the picture shows the tools in position; the lower section shows tools removed to illustrate the back-up lugs that support each cutting tool. National Broach & Machine Co., 6500 St. Jean Ave., Detroit 13, or— **Circle Inform-A-Gram No. A31.**

The Westinghouse Fractional hp Motor line in the NEMA 48-frame size has been completely redesigned. Changes include simplified straight-through ventilation system, sleeve



bearing construction for lubrication, and nylon thrust washers to permit a variety of mounting positions. Westinghouse Electric Corp., Box 2099, Pittsburgh 30, Pa.
Circle Inform-A-Gram No. A32.

Pin Machine. The Brown high speed pin machine will cut 18,000 to 75,000 pins an hour from 1/8" to 3/16" diameter wire in lengths from 7/16" to 4¾", holding lengths to ± 0.0025". Driven by a 3 hp electric motor, the machine has a straightening arbor to



straighten the stock as it enters and adjustable micrometer stop for lengths. The machine can be changed from one size pin to another in 10 min. The L. R. Brown Mfg. Co., 134A Mill River St., New Haven, Conn. **Inform-A-Gram No. A33.**

PULLMAX for CUTTING COSTS

LOOK at what one PULLMAX can do for YOU — in YOUR SHEET METAL, ENGINEERING AND MAINTENANCE DEPT.

1. Straight Cutting
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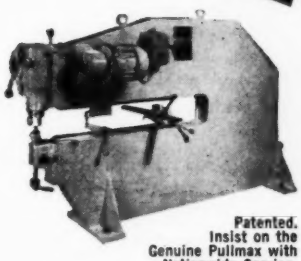
3. Inside square cutting
4. Circle cutting
5. Beading
6. Joggling or offsetting
7. Slot cutting
8. Louver cutting
9. Dishing
10. Edgebending



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AMERICAN PULLMAX COMPANY, INC.

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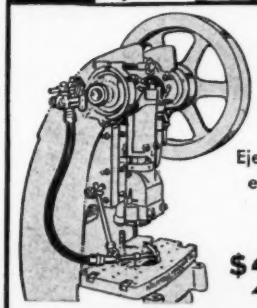
NEWEST LITTELL UNIT Wins Immediate Approval

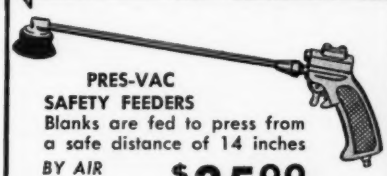
SHEET LIFTER for handling sheets of steel, glass, plywood, boxes, cabinets BY AIR $32.00

LOST FINGERS ARE COSTLY



AIR BLAST VALVES

Ejects parts at each stroke of press BY AIR $29.00



PRES-VAC SAFETY FEEDERS Blanks are fed to press from a safe distance of 14 inches BY AIR $35.00

SAVE MONEY • SAVE TIME SAVE HANDS • SAVE FINGERS

Prices F.O.B. Factory

F. J. LITTELL MACHINE CO. Speed with Safety

AIR DIVISION 4197 RAVENSWOOD AVENUE CHICAGO 13, ILLINOIS

District Offices: DETROIT and CLEVELAND

Write for FREE Catalog

CIRCLE INFORM-A-GRAM KEY NO. 1472

NEW! NEW! NEW!

ENCO TINY TITAN TRADE MARK NO. 150 HEAVY DUTY DUPLEX MAGNETIC BASE HOLDER

FOR MOUNTING TEST INDICATORS Up to 3" in Diameter

Mounts to rods as small as ¾" in diameter, with magnetic pull—125 lbs. Think of that!

Indicator post now firmly brazed to pole piece to insure solidity —an ENCO exclusive.

3-step universal rod in 7/32", ¼" & 5/16" diameters, for all indicators.

V Offset clamp for lugback indicators.

V New fool-proof adaptor.

V Jack-type release & positioning screw.

V Ball swivel and stem of brass & non-magnetic material.

Case, non-breakable Tenite plastic, 1¾"x 4" x 1⅜" high.

Shows Model No. 150 being used to indicate workpiece on engine lathe.

Price Complete

$15.50

Attractively Boxed

SEND NOW FOR BULLETIN NO. 605 COVERING OTHER TINY-TITAN TOOLS

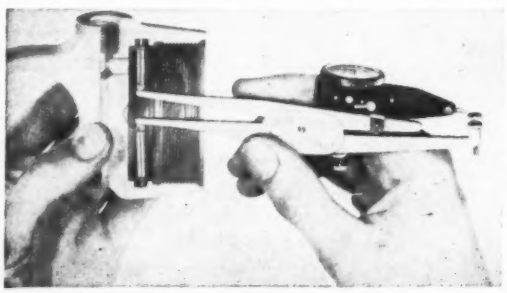
No. 100	Magnetic base holder, pull, 65 lbs.	$ 8.00
No. 120	Combination magnetic base indicator holder and magnifier, pull, 65 lbs.	$12.50
No. 130	Precision adjustment magnetic base holder, pull, 65 lbs.	$ 9.50
No. 160	Precision adjustment heavy duty duplex magnetic base holder, pull, 125 lbs.	$17.75
No. 200	Magnetic base "HANDI-LITE", pull, 65 lbs.	$ 8.50
No. 250	Heavy duty magnetic base lighting unit—holds 100 watt bulb, pull, 125 lbs.	$18.50

ENCO MANUFACTURING COMPANY, Dept. 745
4520-26 W. Fullerton Ave., CHICAGO 39, ILL.

Sold all over the U.S. and Canada through Enco franchise dealers.

CIRCLE INFORM-A-GRAM KEY NO. 1481

INDI-CAL (Indicator-Caliper) "O" RING & BORE GAGE



Fills a long felt need for a practical, low-cost dial bore gage. INDI-CAL offers these features:

- Sturdy Construction
- Micrometer Adjustments
- Spring loaded
- Satin finish
- Range .400" to 6" or larger
- Special points available
- Adaptors for "Last Word", "Gem", and other indicators @ $1.

BRAND TOOL & SUPPLY CO.
907 S. Victory Blvd., Burbank, Calif.

INDI-CAL (.600" to 2⅝") w. case $11.95

CIRCLE INFORM-A-GRAM KEY NO. 1482

HARDENED and GROUND HSS BLANKS

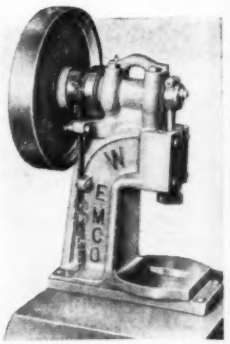
Any decimal diameter to ⅝"—in any length.
Mirror finish surface to gage tolerance.
Many uses —
—core pins, punches, gages, ejector pins, insert pins, special tools, etc. — Quick delivery.

Write or phone Millburn 6-4222 for price list D-3

WILLIAM T. HUTCHINSON CO.
P.O. Box 328, UNION, N. J.
Factory: Springfield, N. J.

CIRCLE INFORM-A-GRAM KEY NO. 1483

EMCO "W", 5-ton bench type; also larger EMCO "X", 10-ton. Both sizes also stand-mounted. With or without motor drive.



EMCO

Power Punch Presses Are Speedy and Safe

Versatile EMCO presses excel for punching, forming, stenciling and riveting metal, leather, plastics and other non-metallic materials. Up to 300 operations per minute. "Big machine" speed, strength, rigidity, accuracy, endurance. Compact, fool-proof; simple design—easy to operate. Thousands of EMCOS in money-making use testify to Klaas dependability since 1921. Two practical sizes.

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KLAAS MACHINE & MFG. CO.
4312 East 49th St., Cleveland 25, Ohio

— KLAAS BUILT —

CIRCLE INFORM-A-GRAM KEY NO. 1484

"FAST CUTTING" Metal Finishing Compound

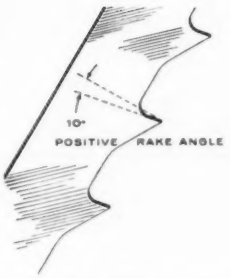
- For ALL Types Lapping Machines.
- Stays in suspension without agitation.
- Corrosion preventing, excellent cleaning, perfect wetting, does not become rancid.
- Prevents stone loading when honing.
- Stocked in all popular types, grits—320 and finer.

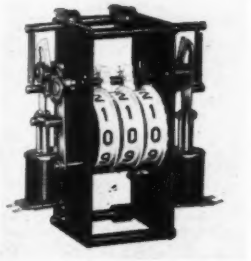
Write for literature on our scientifically different compound and products.

ABRASIVE ENGINEERS
245 Waukegan Ave., Highwood, Illinois
Sales Agency for SCIENTIFIC ABRASIVES (not inc.)

CIRCLE INFORM-A-GRAM KEY NO. 1485

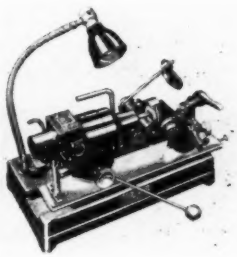
Production of "Hook Tooth" Band Saw Blades is announced by The Henry G. Thompson & Son Co., New Haven, Conn. Instead of a 90° face, each tooth has a positive rake which hogs into the work, permitting a rapid feed rate and free cutting action.
Inform-A-Gram No. A34.

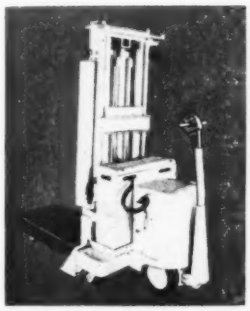




This Adding-Subtracting Counter introduced by Spencer Mfg. Co., 3253 N. Cicero Ave., Chicago 41, is practical for many operations including those that require maintaining a set capacity, such as controlling flow of materials, production and inventory, and control of physical capacity in areas.
Inform-A-Gram No. A35.

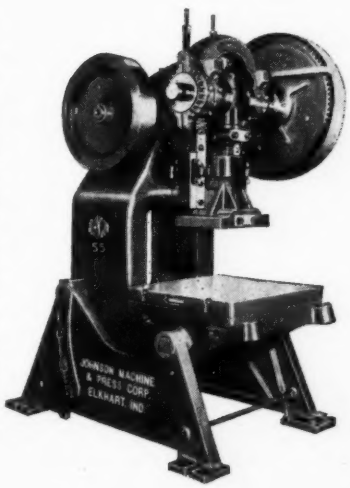
More Than 20 Changes and Improvements are incorporated in the new Drill Grinder by Dumore Precision Tools, Racine, Wis. It is ideal for precision pointing standard drills or reclaiming broken or worn drills. Features include a web-thinning wheel roughing wheel, magnifying lass, and diamond wheel dresser.
Inform-A-Gram No. A36.





This Hydroelectric Hand Motorized high lift platform truck is manufactured in 2000 lb and 3000 lb capacities. The "KWH" features the "Dyna Dual" power unit. Both power unit and hydraulic assembly have low current draws on the battery. Lifts of 60", 108", and 120" are available. Lift Trucks, Inc., Cincinnati 14, Ohio. **Circle No. A37.**

This 56-Ton Capacity open back inclinable punch press with 4" stroke is one of three models by Johnson Machine & Press Corp., Elkhart, Ind., of interest to die cast trimmers, large light sheet, and aluminum sheet users. Bed is 34" wide and 32" deep and 9" stroke is available on special order. Flywheel type press delivers 100 strokes per min and the bull gear type, 45 strokes.
Circle No. A38.



For SMALL LOT, SHORT RUN STAMPINGS, it'll be smart to have us on your line! You can be certain that there are no suckers where we do business. Right now we are enabling many producers to increase their output by supplementing their plant facilities with our own.

Rejections? Only ½ of 1%. Permanent tooling has no edge on us!

Why not drop us a line today?

FREE
1. Write now for a free sample part with a cost summary.
2. Our free bulletin also illustrates 40 small stampings.
3. Send in your blueprints to our engineering department for a prompt quotation.

LOW DIE COST
FAST DELIVERY
- Blanking
- Forming
- Piercing
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- Drawing
- Extruding
- Stenciling
- Tapping
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3283 E. 80th Street, Cleveland 4, Ohio

CIRCLE INFORM-A-GRAM KEY NO. 1491

Companion tools – NOBURSINK for openly accessible hole faces and NOBUROD for outer ends of rods, tubes and bosses – provide greatly improved work quality, faster and easier than ever before. Both have low torque design permitting rapid, off-hand workpiece handling without chatter – even on large diameters. Unique design allows regrinding without special tools.

Eliminate makeshift and less efficient tools

Both NOBURSINK and NOBUROD tools work equally well on all metals. Cutting chips are freely expelled from the work area. Each tool accommodates a wide range of work size – and are furnished 90° included angle (produces 45° chamfer).

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OPTICAL CHARTS • ETC.

New . . .

24-PAGE CATALOG

NO. 54-1507

GAGE COMPANY *Deep-Etch*

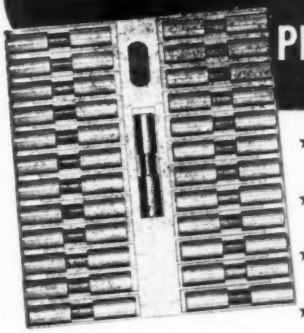
COMPARATOR CHARTS AND ACCESSORIES

GAGE COMPANY

BATTLE CREEK, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1501

CLOSER TOLERANCES with DELTRONIC TENTH PLUG GAUGES



★ Size variation by ten thousandths

★ Set of 25 costs approximately same as Go and No-Go gauge.

★ Available in increments of 1/64" from 1/8" to 1"

★ Hardness is Rockwell C62/C64

This new system of precision gauging provides one gauge of nominal size plus 12 gauges of increasingly larger sizes in .0001" increments and 12 gauges of decreasingly smaller sizes in increments of .0001". Each gauge is identified. It is the same size on both ends to double the life in usage.

For further information write Dept. D1.

DELTRONIC CORPORATION

1507 RIVERSIDE DRIVE • LOS ANGELES 31, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1502

EVERY ENGINEER will want to know all about Hannifin's new Square-Type Air and Hydraulic Cylinders that incorporate the biggest single improvement in cylinder design in the last

50 YEARS!

WRITE FOR

BULLETIN 113
Hydraulic Cylinders 2000 p.s.i.—3000 p.s.i. (non-shock)

BULLETIN 213
Fluid Power Cylinders 200 p.s.i. (air or oil)

HANNIFIN

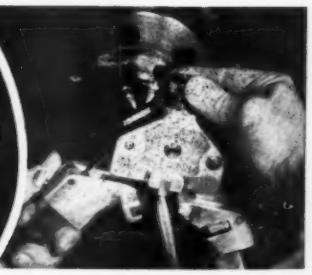
Hannifin Corporation, 563 S. Wolf Road, Des Plaines, Illinois
Air and Hydraulic Cylinders • Presses • Air Control Valves

CIRCLE INFORM-A-GRAM KEY NO. 1503

Hone parts to .0001" tolerance on any lathe or drill press

with inexpensive

Odee-HONE



The Odee-Hone quickly produces an accurately honed finish on any type of external cylindrical part. It removes a few tenths or several "thousandths" stock to bring parts to size in less time than is required to set up for grinding.

Corrects all out-of-roundness, waviness and chatter.

Hones parts from ½" to 2½" in diameter, any length, any material.

Requires no aligning, fixturing or wheel dressing.

No springs, no hinges to break or wear out.

Weighs only 2½ pounds.

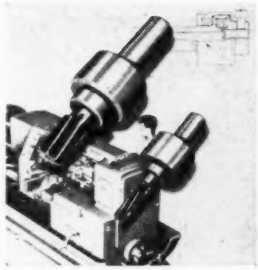
Can soon pay for itself in time saving. Write for detail sheet AR-116 and price.

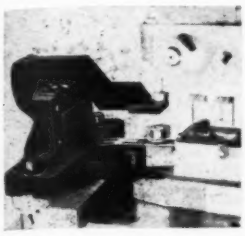
MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT • DETROIT 38, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1504

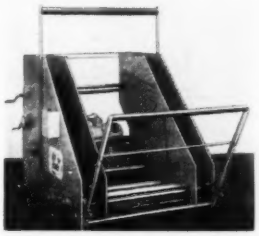
Improved Accuracy in Reaming and Tapping operations on turret lathes and automatics is possible with the new floating holder by Scully-Jones & Co., Chicago 8. The floating action eliminates bell-mouthed, out-of-round holes in reaming and guards against oversized and tapered threads in tapping. **Inform-A-Gram No. A39.**

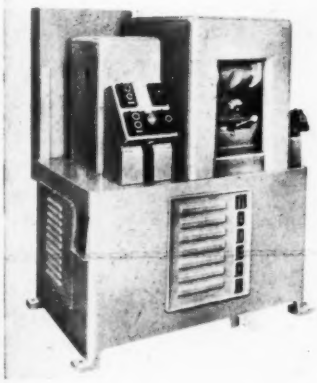




This Scrap Chopper for stock up to 6" wide, by Jaco Devices, Inc., 96 High St., Hingham. Mass., is powered by the punch press ram, clamps to the press bed, and handles steel stock up to 0.062" thick. It is independent of the die and spare blades can be installed quickly whenever the cut-off blade needs sharpening. **Inform-A-Gram No. A40.**

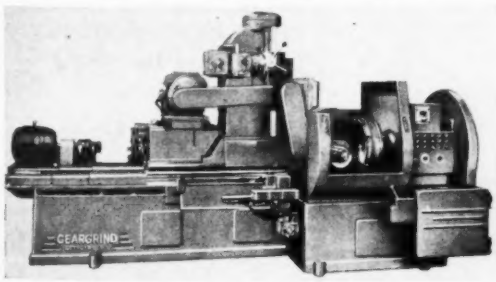
The New Koil Kradle of 4000 lb capacity is one of a large group manufactured by Benchmaster Mfg. Co., Gardena, Calif. It accommodates coil stock up to 32" wide and 60" dia in conjunction with punch presses, shears, etc. **Inform-A-Gram No. A41.**





Hypoid Pinions are chamfered automatically on this single-station "Burr-Master". Production rate is 250 pinions per hr and one unskilled operator can readily handle two machines. Get additional information from Modern Industrial Engineering Co., 1420 Birwood Ave., Detroit 38, or **Circle No. A42.**

New 30" Internal and New 36" External Gear Grinding machines are introduced by the Gear Grinding Co., Detroit Both are automatic form grinding machines for



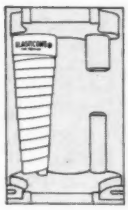
working on gears, splines, and specially contoured parts. An outstanding feature is the hollow, rigid workhead spindle. **Circle Inform-A-Gram No. A43.**

Leading Auto Makers Save $1,250,000*

On Dies Equipped With

ELASTICONE GUIDE PIN COVERS

**Actual savings reported during one year on materials, maintenance and manpower!*



Leading auto makers, like many other major industries, have reduced the costs of die operations by equipping dies with Elasticones. Elasticones close the gaps between pins and bushings, protecting pins against nicks and scratches, reducing die breakage, increasing press time!

Elasticones reduce the need for spare dies, make automatic press work possible. *Write today for complete technical data and literature. Elasticones are available in stock and custom sizes.*

CENTRAL

2210 EAST HUNTINGDON ST. PHILA. 25, PA.

CENTRAL SAFETY EQUIPMENT COMPANY

CIRCLE INFORM-A-GRAM KEY NO. 1511

Solves any eyeleting problem!

Edward Segal

AUTOMATIC EYELET ATTACHING MACHINERY

Model NR
Bench Type *(illustrated)*
Stroke 2¾". Depth of throat (end ram to frame) 7¾". Adjustable horn provides ample space for special feeds, fixtures and indexing mechanisms.
Model XNR same as above for hand-feed staking operations, 1½ & 2 ton capacity.

Whatever the size and the materials there's an Edward Segal precision-built machine to do a cost reducing, time saving job on your eyeleting assembly . . . For single or multiple settings. Interchangeable raceways, rams and tool holders give these machines amazing versatility. In constant use in hundreds of plants in all fields.

Submit your specs to us for analysis without obligation, and write for our interesting booklet loaded with eyelet setting data — Bulletin M 73

EDWARD SEGAL • 72 SPRING STREET • NEW YORK 12, N. Y.

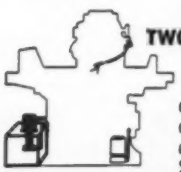
EDWARD SEGAL EYELET ATTACHING MACHINERY SPECIAL HOPPERS AND FEEDING DEVICES

CIRCLE INFORM-A-GRAM KEY NO. 1512

put a
GRAYMILLS
Coolant System

on that machine
for LONGER LIFE...
BETTER FINISH...
FASTER CUTTING

Standard Packaged Units are available from your nearby INDUSTRIAL DISTRIBUTOR

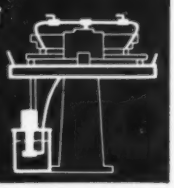


ONE MACHINE... TWO COOLANT PUMPS

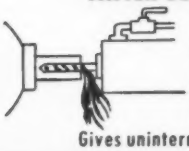
Don't drain sump when you need a different coolant. Merely divert flow to a Graymills auxiliary system. $90.00

GIVE THIS TOOL GRINDER A COOLANT SYSTEM FOR $79.50

Abundant flow for better finish and life on carbide cutting tools.



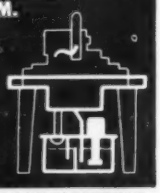
FASTER DEEP HOLE DRILLING



with oil-hole drill and GRAYMILLS Pressure Type Coolant System. Auxilliary system flushes chips through holes in tips of drills. Gives uninterrupted feed. $137.50

ABRASIVE CUT-OFF MACHINE GETS COOLANT SYSTEM.

Wheels cut faster—last longer. Delta Machine system complete $112.50. Pump system only $68.00



NEW COOLANT MANIFOLD FOR MULTIPLE DRILLS...

Off and on control. Coolant flows as drilling starts. Nozzles need no adjustment. Complete with off-and-on valve.. $62.00

SEND FOR "IDEA" BOOKLET that shows how GRAYMILLS Coolant Systems are used effectively on many other machines not shown here.

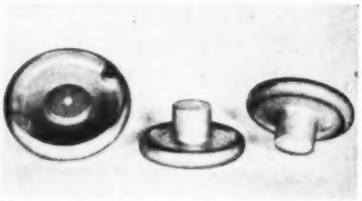
GRAYMILLS CORPORATION
3713 N. LINCOLN AVE. · CHICAGO 13, ILL.

CIRCLE INFORM-A-GRAM KEY NO. 1521

This New "Multicut" tool holder for medium duty machining operations features "throw-away" carbide

inserts, serrated carbide-tipped chip breaker-clamp, and one-piece anvil-locator plate. Wesson Co., 1220 Woodward Hts. Blvd., Detroit 20, Mich. **Circle Inform-A-Gram No. A44.**

Solid Aluminum Alloy Disc Hand Wheels for use on jigs and fixtures for cranking shafts make up a new

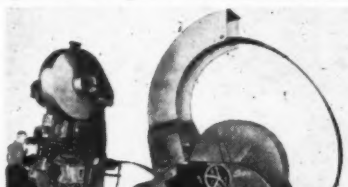


line of products by Jergens Tool Specialty Co., 712 E. 163 St., Cleveland, Ohio. O.D. is finished, boss faced off, and spot centered. **Circle Inform-A-Gram No. A45.**

"Fast Cutting" Metal Finishing Compounds for all types of lapping machines stay in suspension without

agitation and are stocked in all popular grits, 320 and finer, by Abrasive Engineers, 245 Waukegan Ave., Highwood, Ill. **Inform-A-Gram No. A46.**

A Combination Cradle and Straightener with a reverse loop feature that saves valuable floor space in the press room is offered by



Special Equipment & Sales Co., 3949 E. 9-Mile Rd., Hazel Park, Mich. The company's catalog explains all the features of the "Sesco" unit. **Circle Inform-A-Gram No. A47.**

MICRO-HEIGHT GAUGE
BY FAIRFIELD GAUGE CO.

NO OTHER GAUGE COMPARES FOR FAST, ACCURATE LAYOUT AND MEASURING

•

Capacities to 6" when used with this Fairfield Gauge 3" Riser

The Micro-Height Gauge is a precision instrument, finished in satin chrome, which reads like a micrometer and measures from zero at base to 3" in thousandths.

Use as a scriber for fast layout, or insert dial indicator for quick, accurate inspection.

Toolmakers, Layout men, and Inspectors do better work faster with Micro-Height Gauge.

Write for illustrated circular and prices.

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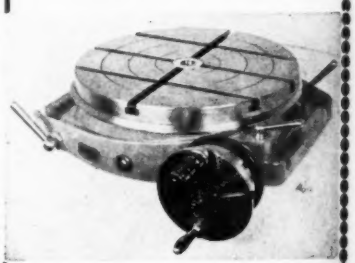
735 Carnegie Ave., Cleveland, O.

CIRCLE INFORM-A-GRAM KEY NO. 1522

WALTER



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AN $8.00 RESHARPENING WILL OUTLAST APPROXIMATELY 150 ORDINARY STEEL HAND FILES
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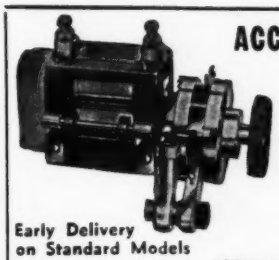

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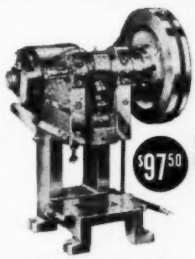

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ALLEN PUNCH PRESS
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Powerful—Dependable—Economical
For Light Work — Stamping, Forming, Riveting—Metal, Fiber or other material.
Overall height 19⅜"—Base size 9" x 8¼". Die bed 6¼" x 8"—Ram face 1½" x 3½". Ram stroke ¾"—Positive ¾" ram adjustment. Sturdy, Single pin, non-repeat hand lever clutch. V-belt drive—Weight 105 lbs. Requires only 1/3 H.P. motor. The machine of a thousand uses! Adequate for many types of work now done on large presses at greater expense.

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30-DAY MONEY-BACK GUARANTEE
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Dealer Inquiry Invited

ALVA F. ALLEN, Dept. TP, Clinton, Missouri

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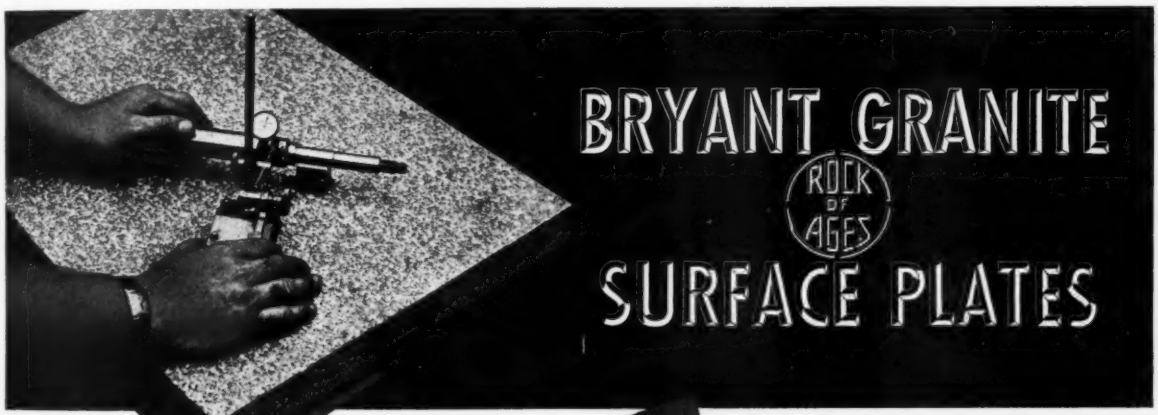

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3 NEW PORTABLE CLAMPS WITH

TRIGGER-RELEASE!

Model 484

DE-STA-CO

Instant easy action enables operator to release clamp *with one hand!*

TRIGGER-RELEASE—Finger pressure on Trigger instantly throws jaws wide open, ready for next clamping action.

GREATER CLAMPING PRESSURES—Up to 1200 pounds may be exerted. Normal operating pressures of 300 to 500 pounds are easily obtained.

RUGGED CONSTRUCTION—60% heavier heat-treated forged components. Hardened bushings locked with spun rivet.

Model 482

Model 486

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World's FIRST Line of TOGGLE CLAMPS

344 Midland Avenue • Detroit 3, Michigan

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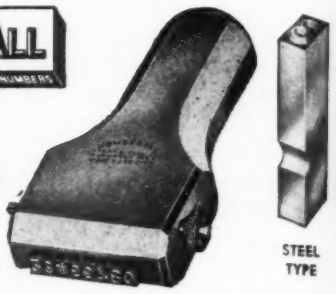
CUTS THE COST OF STAMPING NUMBERS

IMPROVED TYPE HOLDERS for stamping into Metal, etc.



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Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction . . . just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters.

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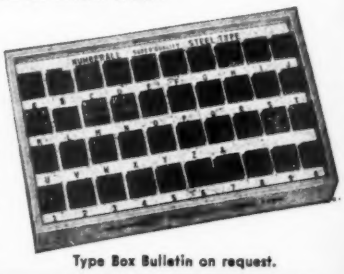

Type Box Bulletin on request.

NUMBERALL STAMP & TOOL CO.

HUGUENOT PARK STATEN ISLAND 12, N. Y.

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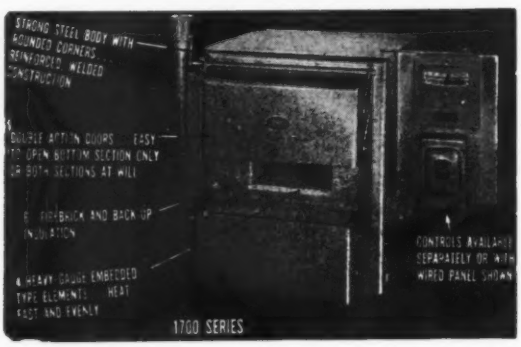
CUT HEAT-TREAT COSTS

. . . with this versatile Temco bench furnace

. . . for heat-treating dies, parts, tools, etc.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DOUBLE ACTION DOORS—EASY TO OPEN BOTTOM SECTION ONLY OR BOTH SECTIONS AT WILL
FIREBRICK AND BACK-UP INSULATION
HEAVY GAUGE EMBEDDED TYPE ELEMENTS HEAT FAST AND EVENLY
CONTROLS AVAILABLE SEPARATELY OR WITH WIRED PANEL SHOWN
1700 SERIES

Speed production, lower unit costs with this husky electric furnace. Large enough to take a wide variety of work, yet compact and exceptionally convenient to use. Chamber sizes—9½" wide, 8½" high and 13½" or 18" deep. Heating range 350° to 1900° F., 220 V. operation. Price with controls, $297.50 to $507.50. Furnace only $235 to $285. Write for literature and nearest dealer's name.

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Thermo Electric Mfg. Co., 474 Huff St., Dubuque, Iowa

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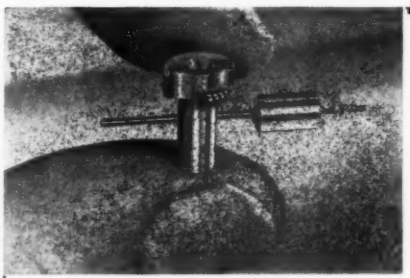

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Special Holes ARE STANDARD!

No change in price or delivery for metric and special hole sizes in STANDARD MICRO DRILL GUIDE RANGE OF #80 to 3/32" in listed body sizes.

PLUS . . .

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Commonly recurring sizes are stocked finished. Also complete stock of 75 semi-finished standard body styles and sizes—ready for completion.

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No counter bore . . . diamond lapped hole with full length drill bearing.

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MICRO DRILL GUIDE

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The precision of a machine tool plus the durability of a workhorse. Complete with ½ H.P. Heavy Duty Motor and automatic band tension control. Nothing like it for finishing metals, plastics, wood, fibre, etc.

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No Tool Holder GRIPS like a Clark

- Adjustable Vee Block Grip
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- One Holder Handles Many Bit Sizes
- Carbide Models Also Accommodate Boring Bars
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Specify Right or Left Hand Offset!

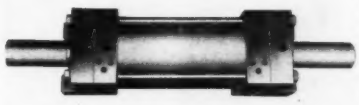
FOR CARBIDES (No Rake)	Model P60	P61	P62	P64
FOR HIGH SPEED STEEL (15° Rake)	Model 60	61	62	64
SIZE:	0	1	2	4
TOOL CAPACITY	1/8" to 5/16"	3/16" to 3/8"	1/4" to 1/2"	5/16" to 5/8"

Order from your dealer—Ask for Clark!

ROBERT H. CLARK COMPANY
9330 Santa Monica Blvd., Beverly Hills, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1552

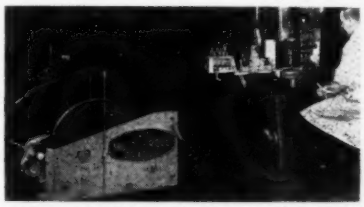
A Continuous-Action, Automatically Reciprocating air-hydraulic booster manufactured by Miller Fluid Power Co., 2040 N. Hawthorne Ave., Melrose Park, Ill., is capable of



delivering an unlimited amount of high pressure fluid for the operation of hydraulic cylinders. The heavy duty, double-action model operates from ordinary plant compressor air input. **Inform-A-Gram No. A48.**

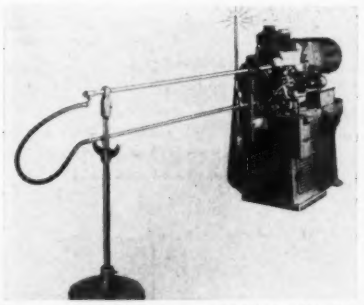
This Gusher Pump for center coolant trough mounting on traveling machines has a reinforced tapered tubular housing for passage through the limited width slot in the trough cover. Its one-piece electronically balanced shaft assembly rotates on two heavy duty ball bearings. Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2, Ohio. **Circle No. A49.**

The U.S. "Multi-Roll Cradle" is adjustable and accommodates stock widths up to 9". Its 1/3 hp geared



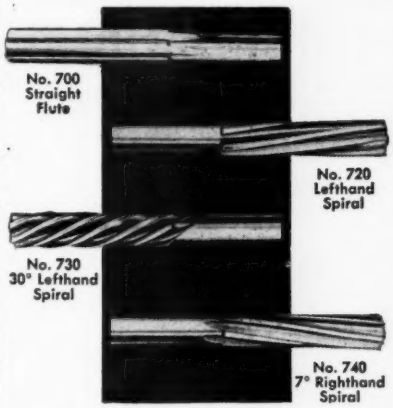
motor permits output speeds to 80' per min. Ask for Bulletin No. 90 from U.S. Tool Co., Inc., Ampere, N. J., or— **Inform-A-Gram No. A50.**

"Hydra-Lite" Bar Feeds for screw machines eliminate feed fingers, tubes, and slides. These units by



Boyar-Schultz Corp., 2000 S. 25 St., Broadview, Ill., are hydraulically operated. For full information, — **Circle Inform-A-Gram No. A51.**

SUPEREAM
the only
DECIMAL REAMER
with all Flutes ground Face and Back after heat treatment . . . *preventing*
Clogging or Freezing of chips for REMARKABLE SMOOTH REAMING



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In emergency
PHONE LIBERTYVILLE 2-4200

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GARBERDING

FINGER STOPS

Made in uniform width to fit any standard width slots. Simply grind ends to fit.

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TWENTIETH CENTURY MANUFACTURING CO.
ROUTE 176 and BRADLEY ROAD
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Leading Aircraft

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The advantages of low cost Red Seal Plates and Bars for your tooling requirements. Call or write for this new Red Seal Aluminum Products Brochure.

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SOUTH GATE, CALIFORNIA
LOrain 6-5105
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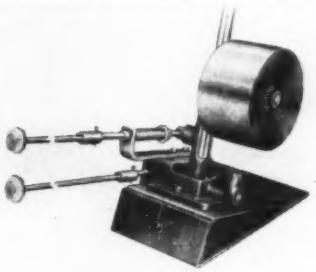
For Automatic Temperature Control in electric furnaces, ovens, or other heating devices the "Amplitrol" pyrometer controller offers accurate

potentiometer type operation. Literature is available from Thermo Electric Mfg. Co., Box 697, Dubuque, Iowa, or — **Inform-A-Gram No. A52.**

A New Bench Model Abrasive Belt Backstand, Hammond's Model 524, will quickly convert your present grinder or polisher into a modern, fast cutting abrasive belt machine.



Model 524 is designed for production work on light polishing or deburring operations and belts up to 4" wide can be used. Hammond Machinery Builders, Inc., 1631 Douglas Ave., Kalamazoo, Mich.
Circle Inform-A-Gram No. A53.

Designed to Drill Holes of various diameters on a wide variety of work up to 24" by 48" or longer, the Model 24 Hillyer Drilling Machine automatically locates and drills any num-

ber of holes up to ½" dia in rapid sequence. Manual layout of templates, printed circuits, etc., is eliminated. Hillyer Instrument Co., Inc., Dep't 48, New York 13, N. Y.
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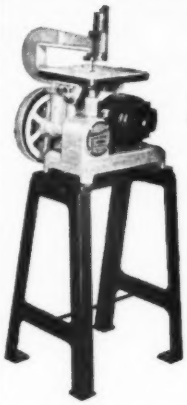
CUT TOOL AND DIE-MAKING COSTS WITH . . . Milwaukee DIE FILERS PROFILE GRINDERS



DIE FILERS
. . . for straight-line sharp corner filing, sawing and lapping

This low cost precision-built unit performs all die making operations at savings up to 40%. Furnished complete with motor and two overarms. No extras to buy.

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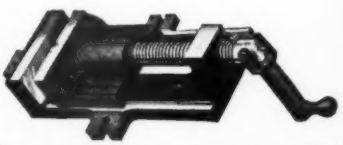
PROFILE GRINDERS
. . . for high speed Precision Grinding of curved and Irregular Contours

Standard features include 20,000 or 30,000 R.P.M., or a combination of these spindle speeds, ½ H.P. motor, Collet Chuck, Compound tilting table, built-in wheel dresser.

RICE PUMP & MACHINE COMPANY
228 PARK AVENUE BELGIUM, WISCONSIN
CIRCLE INFORM-A-GRAM KEY NO. 1562



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• This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

OFFERED IN TWO SIZES

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	4	12½
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Do you need a vise of ANY type? *Write today for bulletin on the extensive Yost line*

YOST MFG. COMPANY
1000 MAIN STREET
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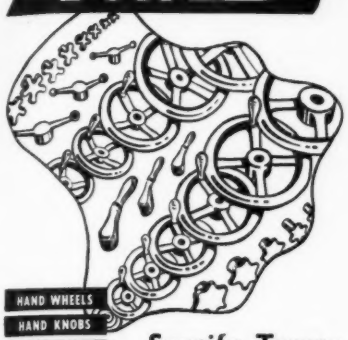
Tomco



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HAND KNOBS
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HANDLES
BALL HANDLES
SPECIALTIES

Specify Tomco for long lasting dependability

A complete line of high grade hand knobs, handles, and hand wheels is available from Tomco. Immediate shipments are made from stock of standard items. Specialty items are made to your specifications.

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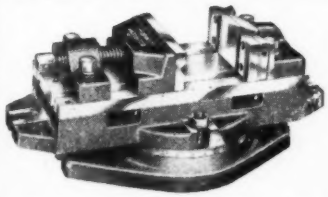

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Here's an accurate machine shop vise that will give you years of hard service. Hardened and ground parts make it impossible to destroy vise by milling or drilling into jaws or body. Sold with or without swivel shown, or plain with ground sides. Write for Bulletin TE2-104.

THE PRODUCTO MACHINE CO.
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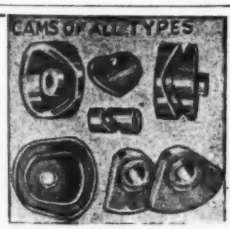
CAMS



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Charles Eisler, Jr., President
EISLER ENGINEERING CO., INC.
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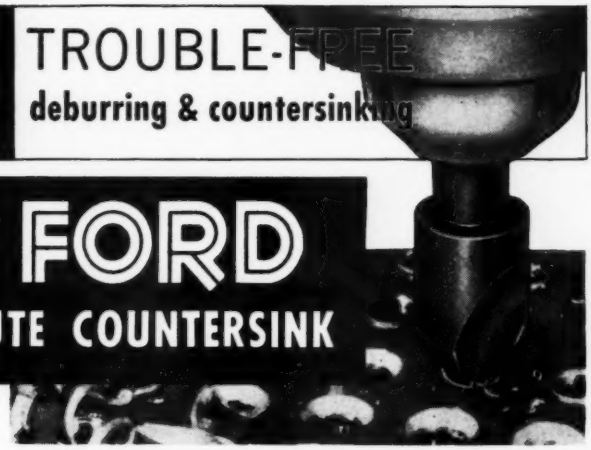
NOW TROUBLE-FREE
deburring & countersinking

with the NEW **FORD**
UNIFLUTE COUNTERSINK



Engineered for maximum efficiency with simple *single flute design*, FORD'S new high speed steel Uniflute *ends all deburring and countersinking troubles* on soft stringy steels, aluminum, brass, bronze, plastic, rubber, wood and other materials. FORD'S new HSS Uniflute covers a *wide range of hole sizes with one diameter tool.* Its cutting action is effective from the working point to the major diameter. Job-engineered shear angles allow superior free cutting, insure trouble-free action, even at higher speeds.

FORD regrinding service adds tool life, reduces tool costs!

FREE information · **Bulletin HSS 408** gives complete information about Ford's new Uniflute countersink, plus easy 4-step instructions on how you can resharpen the Uniflute in your own tool room.

Catalogue No. 207 gives all facts on more than 277 FORD rotary tools including HSS ground cutters, rotary files, countersinks; CARBIDE cutters, end mills, grinding burs. **Send today!**

M. A. FORD MFG. CO., INC.
Pioneers in rotary tools for more than 30 years
817 W. River Street, Davenport, Iowa

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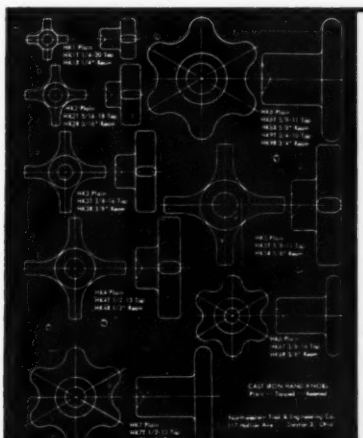

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PATENTED

1. SAVE HUNDREDS OF TOOLING $$$$$$
2. CONVERT TOOLING TIME TO PRODUCTION TIME
3. INCREASE PRODUCTION AND QUALITY

Plus! LOW INITIAL COST. NOTHING ELSE LIKE IT.

$67

Model P2 Cap. 1/8" to 2"
Other Models
and Sizes to 4" Cap.

Just a few of the many setups that can be made rapidly with Multi purpose Work Holders and STANDARD LOW COST Accessories.

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LASSY TOOL CO., Plainville, Conn.

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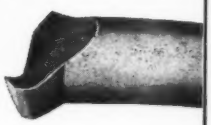
✓✓✓ Check these *3 Comet* 'TIPS' for Precision Boring, Facing and Internal Threading

MADE OF HIGH SPEED or CARBIDE
FOR HOLES FROM 1/16" UPWARD
17 DIFFERENT SIZES

✓ BORING TOOL

- FAST PERFORMANCE
- ECONOMY IN PRODUCTION
- EFFICIENT IN RESULTS

Cutting Edges are lapped for better "Bores" and faster Feeds.

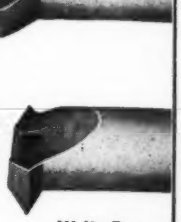


✓ FACING TOOL

- CONSTANT CLEARANCE
- CONSTANT SHAPE OF CROSS SECTION
- EASY RESHARPENING
- CONVENIENT TO USE
- LONG LIFE

✓ INTERNAL THREADING TOOL

- CONSTANT SHAPE AND CLEARANCE
- EASY RESHARPENING
- CONVENIENT TO USE - LONG LIFE



Dealers! Here's a Profit-Maker!

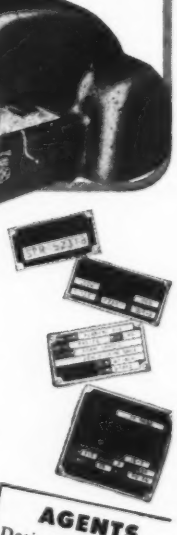
Write For Complete Data

COMET Tool Co.

738-T Broadway
New York 3, New York

CIRCLE INFORM-A-GRAM KEY NO. 1582

How To
Mark Name Plates In
1/5 the Time



Cutting costs in these times is a good trick if you can do it. You can, on plates requiring detail marking, by using an Automark Electric Metal-Marking Typewriter. The operator lightly touches the key and the Automark does the rest, quickly and automatically. No dial to turn—no lever to pull. Marking output is increased five times and worker fatigue is greatly reduced. Write today for Bulletin 8-16.

AUTOMARK
Electric Metal-Marking
TYPEWRITER
Manufactured Exclusively By

AGENTS
Desirable territories open for responsible representatives. Write giving complete information, lines carried and territory covered.

DEFIANCE MACHINE & TOOL COMPANY
1921 South Vandeventer Ave. • St. Louis 10, Mo.

CIRCLE INFORM-A-GRAM KEY NO. 1583

use a GRIPCO LOCK NUT

- *To Hold Tighter*
- *To Last Longer*
- *To Cost Less*

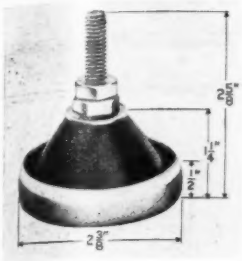
in these and hundreds of other applications where stress, wear or vibration is a factor. The Gripco Lock Nut, with its simple, one-piece design, has given industry a tighter, more positive holding action for quicker fastener application at less initial cost. No inserts, outside devices or complicated features – the Gripco Lock Nut holding or locking action is inherent in the nut itself – it costs less to use, gives an easier, faster locking and holds tighter for a longer time. Impervious to oil or water. For faster production, lower manufacturing and maintenance costs, look into the Gripco Lock Nut today.

GRIPCO PRODUCTS INCLUDE: Gripco Lock Nuts, New Gripco "Clinch" Nuts, Gripco Hi-Nuts, Gripco Pilot-Projection and Countersunk Weld Nuts with or without Gripco locking feature.

112

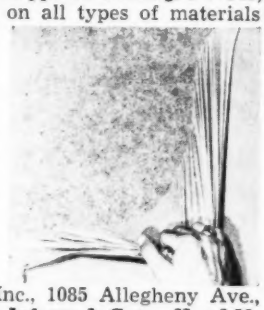
GRIP NUT COMPANY
308W S. Michigan Avenue, Chicago 4, Illinois

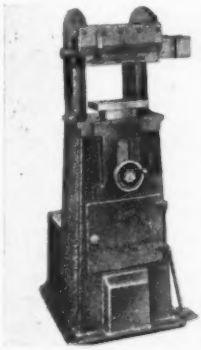
CIRCLE INFORM-A-GRAM KEY NO. 1584



"Instrumount" neoprene insulated mountings for all types of precision manufacturing equipment dampen vibration, insulate against shock, and serve as levelers, for any load from 10 to 50 lbs per mount. Bushings, Inc., 4358 Coolidge Hwy., Berkeley, Mich.
Inform-A-Gram No. A55.

The Aluminum Pigmented Strippable Coating, PV-845, is applied by brush or spray on all types of materials during both inside and short-term outside storage; on polished surfaces to prevent marring, for coating idle tools and dies, to protect against die marks in stamping operations, as a removable film on inner surfaces of spray booths, and as a web coating to completely enclose bulky objects. No surface preparation is required. Specialty Coatings, Inc., 1085 Allegheny Ave., Oakmont, Pa.
Circle Inform-A-Gram No. A56.





Parker No. 650 Marking Machine cleanly and indelibly stamps letters, graduations, etc., on flat, concave, or convex surfaces, in production. Simplified foot pedal controls and cushioned hydraulic pressure are some of the features. Literature is available from The Parker Stamp Works, Inc., Hartford, Conn.
Inform-A-Gram No. A57.

The 55 Series Press Brakes in the SEMCO line feature ease of operation and rugged construction. The brake lining is simple to adjust and may be replaced without dismantling the entire unit. For complete information, contact Service Machine Co., Inc., 162 Miller St., Elizabeth, N. J., or—
Inform-A-Gram No. A58.

Here is Dickerman's "Rol-Di-Feed" conventionally installed on a punch press. Featuring simplicity, adaptability, and economy the units advance stock at relatively

low speeds, resulting in increased accuracy of feed. H. E. Dickerman Mfg. Co., Springfield, Mass.
Circle Inform-A-Gram No. A59.

The coolant stinks, eh?
Well, don't dump it!
We'll kill that odor with the new powder-additive: **Rance-RID**

IT'S A SERIOUS COST-PROBLEM:
Metalworking plants are pouring coolant and labor dollars down the drain. The reason: coolant turns rancid.

RANCE-RID SOLVES THE PROBLEM:
It restores *the original condition* of the oil emulsion. It smells, looks, and *is* like new. No masking odors are used . . . Use it in central-type coolant systems, or in individual machines. Treat the same coolant over and over again!

TRY RANCE-RID—AT OUR EXPENSE:
That sounds generous. Actually, it isn't. Rance-Rid sales have been built on *one-ounce samples. Just one ounce treats 20 gallons* of soluble oil emulsion . . . Try it—at no cost. Your inquiry brings the sample.

HERSEN CHEMICAL CO.
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Your Inquiry brings this **FREE SAMPLE**

CIRCLE INFORM-A-GRAM KEY NO. 1591

SOLVE YOUR HOLE ACCURACY PROBLEM with *Horberg* PRECISION PIN GAGES

EXCLUSIVE CONCENTRIC ENTRY TAPER for faster, more definite inspection of holes, for greater ease in centering. Gage sets supplied for all common drill sizes.

TOLERANCE +0.000 -0.000

SETS: Two gages in each size, with convenient stand.

Letter Set (A-Z) 52 Gages $50.00

Fractional Set (1/64 - 1/2, in steps of 1/64) 60 Gages 56.00

Number Set (1-60) 120 Gages 104.00

ALL SHIPMENTS FROM STOCK

THE *Horberg* GAGE COMPANY
affiliate of Horberg Grinding Industries, Inc.
29 Staples St., Bridgeport, Conn.

Please send Horberg Pin Gage Catalog to
NAME _____
TITLE _____
(Please attach to company letterhead)

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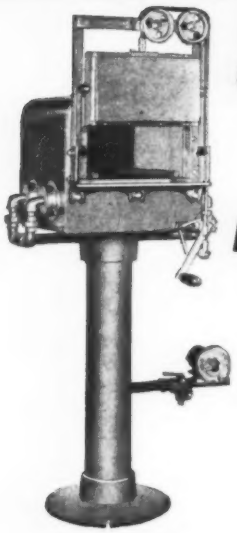

SAVE HOURS CUT HEAT TREATING COSTS

Save time, save gas . . . heat treat carbon and high speed steels, dies and tools with JOHNSON 142. Powerful burners provide fast, uniform heat. Gets the job done while other furnaces are still warming up. Temperatures easily regulated. Firebox 7" x 13" x 16½" lined with high temperature refractory. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

Quick Acting JOHNSON No. 142 Hi-Speed Furnace

For temperature range 1300° to 2350° F. . . . $325.00

F.O.B. Factory

Models available in smaller firebox sizes. Write for Free Catalog.

JOHNSON GAS APPLIANCE CO.
575 E Ave. N.W., Cedar Rapids, Iowa

JOHNSON Since 1901 **FURNACES FOR INDUSTRY**

CIRCLE INFORM-A-GRAM KEY NO. 1601

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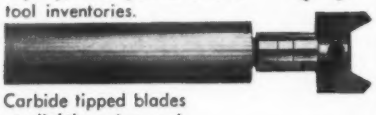
2 HAYDEN WIDE RANGE BORING BARS fill your needs

Any size hole from 1" to 4" can be bored out with 2 Hayden Wide Range Bars. They come in two sizes, 1" to 2"; 2" to 4". Hayden Wide Range Boring Bars impart a smooth finish on the I.D., cut accurately and rapidly, and permit smaller tool inventories.



Carbide tipped blades at slightly extra cost.

HAYDEN TWIST DRILL CO.
8628 Lyndon Ave., Detroit 38, Mich.

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RAPID SET-UPS: with extreme accuracy—every time and on the first try!

Brookfield TOOL HOLDER

One Brookfield Tool Holder = One Conventional Tool Holder + Stock of at least 100 Bushings.

In Essence: A Floating, Precision Vise

- Adjustable V Jaw
- Axially True Design
- Balanced-Pressure Locking

No more fussing with bushings . . . just slip tool in jaw and tighten . . . run-out is less than .0001 per inch . . . Brookfield Tool Holders guarantee clean, easy, solid set-ups every time and on the first try! Models available for nearly all automatic and hand screw machines, turret lathes, radial drills, etc. Also useful as Adjustable Steady Rest and Work-Holder.

Write Dept. H. for descriptive brochure

BROOKFIELD, INC. 240 Cushing St. Stoughton, Mass.

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DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

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has been done with the **SCLEROSCOPE** since 1907

THE SHORE INSTRUMENT & MFG. CO., INC

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Attain — Real TOOLROOM Efficiency with OLIVER DIE MAKING MACHINES

BE WISE — OLIVERIZE

Speedy, efficient and accurate are OLIVER DIE MAKING MACHINES... proved in more than 10,000 installations throughout the world. They are consistently effecting cost reductions of as much as 60% by simplifying sawing, filing and lapping operations. Because they save time and do not require expensive skilled labor, OLIVERS have been in constant use in many plants for more than 25 years.

Engineered, designed and built by OLIVER of Adrian these die makers have proved themselves unsurpassed for accuracy. Proved invaluable on Production Filing, Experimental Work, Metal Patterns, Cams, Gages and Templates, OLIVERS have been serving industry for almost 40 years. Cut down your die making costs . . . increase your output . . . saw, file and lap with OLIVER DIE MAKING MACHINES.

OLIVER DIE MAKERS Available in 5 Models

The Bench Model S-1 (illustrated) is a single speed die maker for use on tool steel up to 1" thick.

The Heavy Duty Model (illustrated) has 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

Write Today For Complete Technical Data on OLIVER DIE MAKERS

See our catalog in Sweet's Directory

MACHINE TOOLS by OLIVER include:
AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS
DRILL POINT THINNERS
TEMPLATE TOOL GRINDERS
FACE MILL GRINDERS
DIE MAKING MACHINES

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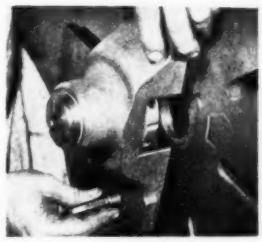
1436 E. MAUMEE · ADRIAN, MICHIGAN

CIRCLE INFORM-A-GRAM KEY NO. 1606

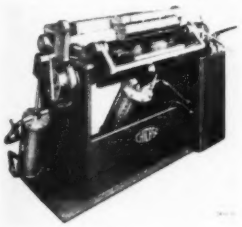
A New Tool Holder for use with Bokum boring tools on screw machines or turret lathes permits more accurate and faster boring of holes. Calibrated scales on top of each holder make it easy to set the adjustable alloy steel holders. Complete data is available from Bokum Tool Co., 14775 Wildermere Ave., Detroit 38, or— **Inform-A-Gram No. A60.**

The Tapmatic "300" Tapping Attachment is designed to eliminate the human variable "lead error" obtained with conventional attachments. It does not require spindle pressure by the operator while tapping. A reversing mechanism permits instantaneous reversal of the tap at any time. Tapmatic Corp., 845 W. 16 St., Costa Mesa, Calif., or — **No. A61.**

The Economy 5C Face Plate Collet Adapter is a simple lathe accessory especially designed for accurate truing. Ideal for small shops or tool rooms, it enables rapid setups for turning eccentrics and permits the standardization of 5C collets. Eco Engineering Co., 12 New York Ave., Newark 1. N. J. **Circle No. A62.**

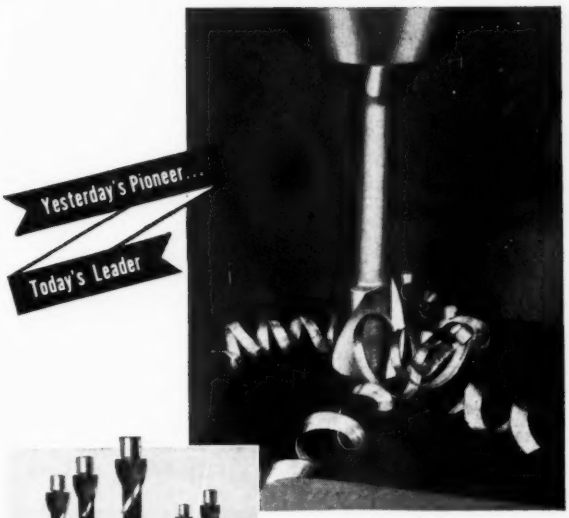


Three Folder Brake models — a single-wing (illustrated), a double-wing with open-throat and fixed head, and a double-wing with open-throat and moving head — are announced by Dreis & Krump Mfg. Co., 7400 S. Loomis, Chicago 36. All models are custom built to meet individual requirements for length of bend, distance between bends, etc. Literature is available. **Inform-A-Gram No. A63.**



The New Matrix Optical Twist Drill Comparator checks the correct angle and centrality of drill points accurately with optics. Drills 1/16" to ¼" dia can be measured on the projector, which has 5X magnification. The Matrix Comparator and literature are available from Engis Equipment Co., 431 S. Dearborn, Chicago 5. **Circle Inform-A-Gram No. A64.**

WELDON
"TU-LIP" COUNTERBORES



for
FAST, FREE CUTTING

As the name implies, WELDON "Tu-Lip" counterbores have only two cutting lips or flutes. This feature, together with the fast spiral, makes the "Tu-Lip" the fastest, freest cutting counterbore on the market.

Breakage due to clogging is prevented because this improved cutting tool provides more than ample chip room. Furnished singly in sizes desired or in convenient wood block sets as illustrated.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you.

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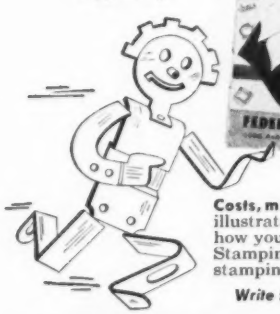
THE WELDON TOOL CO. Cleveland 4, Ohio
3000 WOODHILL ROAD

CIRCLE INFORM-A-GRAM KEY NO. 1611

NEW FREE CATALOG

FOR
- Designers
- Purchasing Agents
- Engineers
- Superintendents
- Managers

FREDDY FEDERAL will rush your copy today!



Costs, materials, and procedures graphically illustrated. New catalog tells where and how you can save money using Short Run Stampings. Also design tips to reduce stamping costs.

Write for your copy of catalog 201 today.

Federal TOOL AND MANUFACTURING CO.
3614 ALABAMA AVE. (ST. LOUIS PARK)
MINNEAPOLIS, MINNESOTA
"QUALITY STAMPINGS IN SMALL QUANTITIES"

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You're not gambling
IF you have an ACE in the hole!
ACE DRILL BUSHINGS are always a sure bet!
• Quality • Accuracy
• Largest Deliverable Stocks Anywhere!
Over 22,000 sizes, types and specifications in A.S.A. and ACE standards, micro and super sizes plus bushings for embedment in plastic or castable material.
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Write For Catalog F
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5407 Fountain Ave., Los Angeles 29, Calif.

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Drill Hardened Steels without Annealing –

With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon–high chrome steels of any degree of hardness.

"HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly.

Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" drills are cutting costs in thousands of plants.

You Harden It—We'll Drill It—With "HARDSTEEL"

BLACK DRILL COMPANY, INC.
1368 East 222nd St. • Cleveland 17, Ohio

Also makers of— BLACK DRILLING UNITS—AUTOMATIC, SELF-CONTAINED—FOR COST-CUTTING PRODUCTION ON ALL MATERIALS
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INCREASE PRODUCTION.. SAVE TIME & MONEY ON YOUR DRILLING OPERATIONS

MEYCO
Carbide Inserted Bushings last longer, cost less in the long run

Here is a bushing that combines the best features of steel and carbide; the strength of steel and the long life of carbide. First cost: slightly higher than ordinary steel bushings; their life: many, many times as great. In addition to such obvious savings, MEYCO bushings increase the life of drills and reamers, produce accurate work for a longer period of time, save on machine-down time and on nonproductive man-hours.

☆

Auto manufacturer says: "... the steel bushings previously used averaged about 28 hours life. MEYCO bushings ran 1,168 hours before they were unusable."

For information and prices write for Meyco Bushing Catalog No. 41

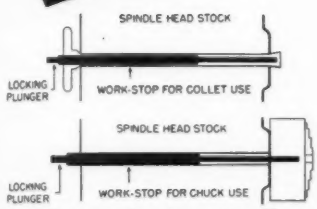
W. F. MEYERS CO., INC., BEDFORD, INDIANA

CIRCLE INFORM-A-GRAM KEY NO. 1624

Modern's Forged High Speed Steel Tools are hand forged to increase impact strength, assure uniform hardness, and control grain flow. A

hardness up to Rockwell 69 is possible with Modern's methods. Contact Modern Tools Div'n of The Nelco Tool Co., Inc., Berlin, Conn. for more information, or—
Circle Inform-A-Gram No. A65.

The Spindle "Work-Stop" increases efficiency, accuracy, and speed of second operation collet and chuck work. It is quickly set up and rigidly locked into the spindle, giving a posi-



tive and accurate stop regardless of variance in the diameter of the work or the position of collet or chuck. D. W. Price Corp., 11161 W. Pico Blvd., Los Angeles 64, Calif.
Circle Inform-A-Gram No. A66.

The Electro-Magnetic Back Gauge by American Actuator Corp., 219 E. 44 St., New York 17, holds material while the press ram is in motion,

enabling the operator to keep his hands clear of the ram and maintaining uniform production, as the sheet stock is drawn evenly to the magnetic gauge. **Circle No. A67.**

JARKE MODULAR STORAGE SYSTEMS

Increase Storage Efficiency... Save Time... Cut Costs

For Permanent Or Temporary Storage

Jarke Mini-Modules give you storage when you want it, where you want it. Easily set up or taken down, no bolts, no tools, no fittings. Special "nesting" caps provide fast stacking and insure rigid, no-slip interlocking tiers. Sturdy steel construction. Lightweight. Four standard sizes. Send for details now!

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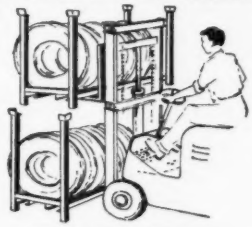
Chicago 40, Illinois



WIRE COIL RACKS

Designed for stacking coiled material, these racks have four-way entry for fork truck, open ends for ram-type deposit of coils. Nesting caps insure fast easy stacking. Heavy-duty steel construction.

PORTABLE BAR RACKS

Unique crane grab permits load centering and rapid fool-proof engagement. Automatic grab also available. Assorted standard sizes. Specials to order.

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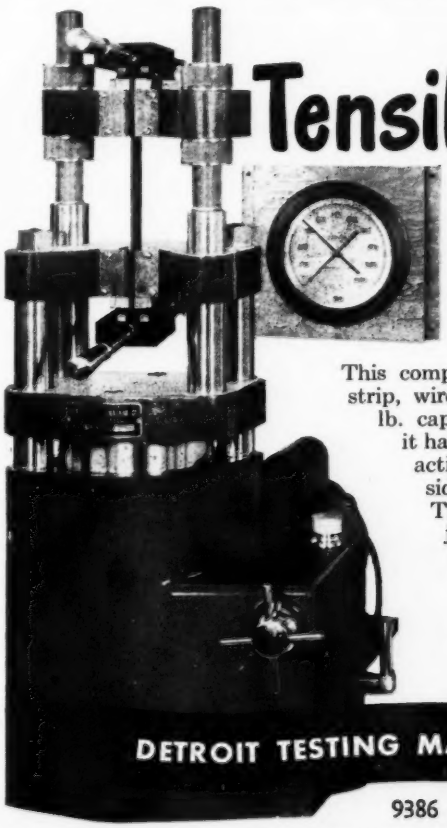

Tensile Testing

Fast! Accurate! Easy!

This compact machine tests spotwelds, strip, wire, anything within its 20,000 lb. capacity. Hydraulically powered, it has an easily controlled ram, self-acting specimen grips that are open sided for easy specimen insertion. This tester, Model ST-1, is adjustable to take specimens 5″ to 9″ in length. Various load gauges, grips, and other modifications are available.

Write for more information – give us your requirements.

DETROIT TESTING MACHINE COMPANY

9386 *Grinnell Ave., Detroit 13, Mich.*

CIRCLE INFORM-A-GRAM KEY NO. 1632

SPECIFY KASSON PRECISION COLLETS AND ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

3AT, 3C
1A, 4C
5C
480
(AC-50)
All collets in hexagon, square and round.
KLUTCH-KOLLET
Stop collet for accurate chucking to 2¾" dia. Soft head for easy boring. Lowest price on market! Models 3AT, 3C, 5C.

FOR ATLAS • LOGAN • SOUTH BEND
CRAFTSMAN • SHELDON LATHES, ETC.

LEVER-TYPE DRAWBAR ½" cap.
Positive grip on undersize, oversize or standard diameter work! Patented coordinate cams eliminate fingers.
HAND DRAWBAR ½" cap.
LIVE CENTER (Ball Bearing) Double sealed for accuracy.

Let us quote on your quantity orders for any type of collet, live center or other machine tool attachment!

KASSON Precision

KASSON Precision products are guaranteed unconditionally for accuracy, fit and long life. Your dealer should have them . . . Write us for literature!

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CIRCLE INFORM-A-GRAM KEY NO. 1641

THE RIGHT TOOL FOR THE JOB IS HALF THE JOB

—An Old Axiom Still True

THE RIGHT TOOL FOR A SMALL END MILL JOB IS A—

MICRO MINIATURE END MILL

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When you think of small END MILLS — think of MICRO MINIATURES

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WOODSON TOOL CO.
4811 LENNOX BLVD., INGLEWOOD, CALIF

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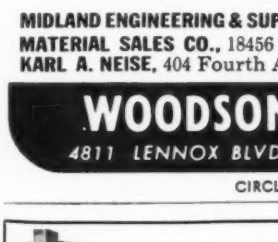
CIRCLE INFORM-A-GRAM KEY NO. 1643



ONE ALL-PURPOSE TOOL HOLDER INSTEAD OF TEN

ONE tool holder for all positions . . . No tool chatter . . . can do internal boring or internal threading . . . Ideal for carbide tools . . . Bit sizes: ¼", 5/16", ⅜", 7/16", ½", ⅝".

Furnished with Cobalt Bits

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NEW YORK 7, N. Y.

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How flat should YOUR SURFACE PLATES be?

This informative, FREE BOOKLET will help you to:

1. Determine your particular needs.
2. Buy no more accuracy than you require.
3. Get the full amount of accuracy you specify and pay for.

SEND FOR YOUR FREE COPY NOW!

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CIRCLE INFORM-A-GRAM KEY NO. 1642

90 FS Automatic Universal FLUTE GRINDER

GRINDS TOOLS LIKE THIS FROM SOLID!

Make your own twist drills, spiral or straight reamers and and mills from solids on a production basis and save money.

Also avoid costly delays when special drills or reamers are required. Make drills as small as 1/16". Indexes automatically. No special skill needed.

Wardwell also manufactures automatic miller for spiral fluting.

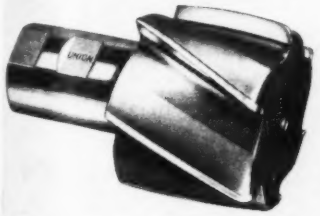
Write for free descriptive bulletin No. 90 FS.

WARDWELL Manufacturing Co.
3809 Ridge Rd.
Cleveland 9, Ohio

Maker of largest line of saw and tool sharpening machines

CIRCLE INFORM-A-GRAM KEY NO. 1645

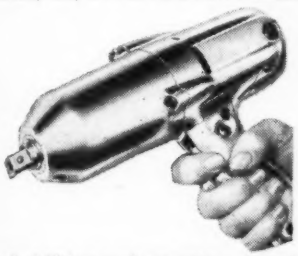
The Large Carbide Inserts are the entire length of the flutes on the new carbide tipped helical milling cutters



by Union Twist Drill Co., Athol, Mass. This maintains a constant shear cutting action the full depth of the cut. **Inform-A-Gram No. A68.**

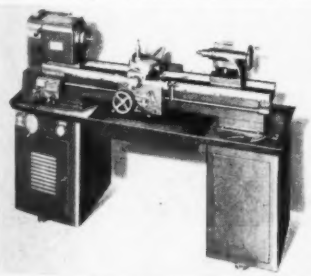
The "Noburmatic" tool deburrs both front and back hole faces simultaneously and produces a small chamfer wherever holes are drilled in sheet metal, plate, extrusions, etc. It is used like a twist drill in a portable drill motor or in a stationary machine tool. Specifications and details are available from Nobur Mfg. Co., 717 N. Victory Blvd., Burbank, Calif., or — **Circle No. A69.**

"Finger-Tip Reverse" in the handle of the new ½" drive electric impact wrench by Thor Power Tool Co., Aurora, Ill., eliminates armature



brush shifting and permits more rigid armature support to develop extra power and permit more solid construction. **Inform-A-Gram No. A70.**

The New 14" Swing Lathe by Logan Engineering is extra heavy throughout. The heavy precision carriage with double-walled apron and disc type clutch combine con-



venience, rigidity, accuracy, and durability. Literature on Model No. 6560 is available from Logan Engineering Co., Lawrence and Lamon Ave., Chicago 30. **Circle No. A71.**

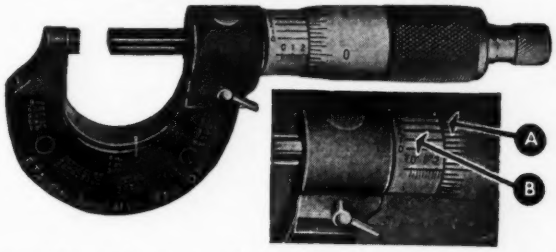
ETALON 23c

THE ONLY MICROMETER GRADUATED IN THOUSANDTHS AND HALF THOUSANDTHS OF AN INCH . . . . .

Reads to .0001 of an inch

ONE-PIECE STAINLESS STEEL SPINDLE AND SCREW

Hardened and ground from the solid.



A. Half-thousandths graduations on thimble allow tenths reading with only 5 vernier graduations.

B. Deep, machine divided graduations on both thimble and barrel assure easy reading under most lighting conditions.

Forged Frame • Heavy Duty Tungsten Carbide measuring faces, optically lapped • Quick acting positive lock • Feather touch friction stop eliminates wear; assures sensitive "feel"

• Dull chrome finish on thimble and barrel eliminates glare.

F.O.B. New York **$18.75**

ETALON PROCH ROLLE Suisse

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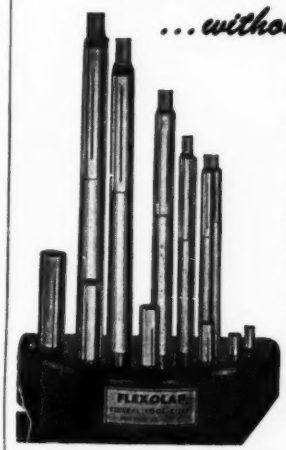
ALINA CORPORATION

401 Broadway New York 13, N. Y.

CIRCLE INFORM-A-GRAM KEY NO. 1651

Flexolap... INSTANTLY AND ACCURATELY ADJUSTABLE FOR FAST CUTTING AND POLISHING

... without danger of galling or seizing!



The Flexolap barrel is made with a series of longitudinal slots milled "off-center" to permit sensitively flexible expansion up to 15%—or more—under pressure of the adjusting pin. This construction enables Flexolap to save valuable time and to lap rounder, straighter holes. For accurate precision take-up, as desired, to maintain size and compensate for wear on barrel . . . simply turn adjustment screw.

Illustrated at left is Flexolap Set No. 1. Includes 6 complete laps, one of each size (3/16", ¼", 5/16", ⅜", 7/16" and ½"), and one additional brass barrel of each size, all held on a sturdy, serviceable stand. Price complete $14.00

Also available in sizes 7/32", 9/32", 11/32", 13/32", 15/32", 9/16", 5/8", 11/16" and 3/4". For lapping holes smaller than 3/16", use the Midget Lap. Seventeen sizes: .032, .036, .040, .046, .054, .062, .070, .079, .090, .104. .120, .135, .155, .170, .187, .218, and .250. Trial assortment (17 laps) $2.10

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FEDERAL TOOL CORP. 3600 Pratt Blvd., Chicago 45, U.S.A.

CIRCLE INFORM-A-GRAM KEY NO. 1652

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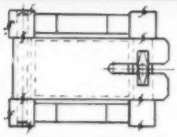
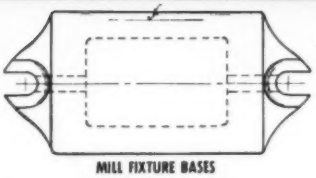
Standards
Save 2/3 the Cost of Custom Making!

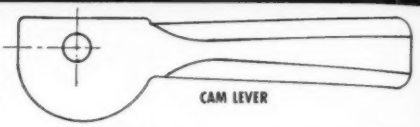
Complete Line of Top Quality
JIG and FIXTURE COMPONENTS
Stocked for Quick Delivery from Dealers Coast-to-Coast

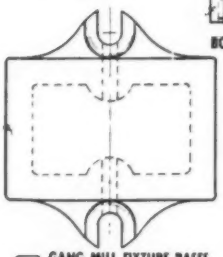
CUT Man-Hours—CUT Design Time—CUT Toolroom Costs

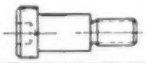
SPHERICAL WASHERS


BOX JIGS—RECTANGULAR

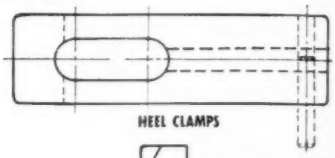

MILL FIXTURE BASES

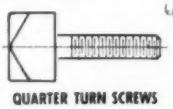

CAM LEVER

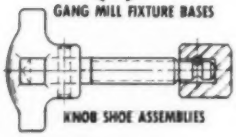

GANG MILL FIXTURE BASES


SOCKET HEAD SHOULDER SCREWS

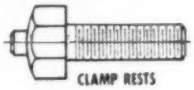
SWING BOLTS

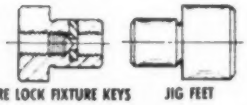

HEEL CLAMPS

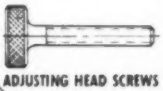

QUARTER TURN SCREWS


KNOB SHOE ASSEMBLIES

GROUND THREAD STUDS


CLAMP RESTS


SURE LOCK FIXTURE KEYS JIG FEET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"C" WASHERS

"T" ANGLE PLATES

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FLANGE NUTS

OVER 500 COMPONENTS AVAILABLE!

HERE ARE NEW ITEMS IN OUR LINE—

- Double Cam Assemblies (9 sizes)
- Chuck jaws (5 sets fit 45 different chucks)
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- Equalizing Assemblies
- Swing "C" Washers
- Equalizing "C" Washers
- Eye Bolts
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- Sure Lock Fixture Key and Buttons
- Fixture Keys
- Jig Legs
- Jig Leg Plates
- Torque Screws
- Toggle Pads
- Locating Pins
- Ball Hand Knobs
- Double Cam Levers

Listed above are new additions to our line. The drawings show a few of our many widely accepted, fine quality Standards... which include Mill Fixture Bases, Box Jigs and our popular T-Angle Plates which are exclusive with Standard Parts Company.

Tracing sheets which save design time are available for every part. Get complete details and facts by writing for our 66-page Catalog.

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Manufacturers of GENUINE NOBLE & STANTON Parts

STANDARD PARTS CO.

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3	23	42	851	1051	1241	1391	1452	1504	1582	1606	1691	1911	1996	2042	2121
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5	25	44	871	1071	1261	1401	1461	1512	1671	1621	1711	1931	2001	2052	2123
6	26	45	891	1081	1271	1402	1462	1521	1572	1622	1712	1941	2002	2053	2124
7	27	46	901	1091	1281	1403	1463	1522	1573	1623	1721	1951	2011	2061	2125
8	28	47	911	1101	1291	1404	1464	1523	1574	1624	1731	1961	2012	2062	2126
9	29	48	931	1111	1301	1411	1471	1531	1575	1631	1751	1962	2013	2063	2131
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11	31	50	951	1131	1312	1421	1481	1533	1582	1641	1791	1981	2015	2072	2133
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14	33	52	971	1151	1331	1423	1483	1541	1584	1643	1821	1983	2021	2074	2161
16	34	54	981	1161	1341	1424	1484	1542	1591	1644	1831	1984	2022	2091	
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19	38	811	1011	1191	1381	1441	1492	1551	1602	1652	1861	1992	2033	2101	
20	39	821	1031	1201	1382	1442	1501	1552	1603	1661	1871	1993	2034	2111	

EDITORIAL ITEMS

A1	A19	A37	A55	A73	B5	B23	B41	B59	B77
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A3	A21	A39	A57	A75	B7	B25	B43	B61	B79
A4	A22	A40	A58	A76	B8	B26	B44	B62	C1
A5	A23	A41	A59	A77	B9	B27	B45	B63	C2
A6	A24	A42	A60	A78	B10	B28	B46	B64	C3
A7	A25	A43	A61	A79	B11	B29	B47	B65	C4
A8	A26	A44	A62	A80	B12	B30	B48	B66	C5
A9	A27	A45	A63	A81	B13	B31	B49	B67	C6
A10	A28	A46	A64	A82	B14	B32	B50	B68	C7
A11	A29	A47	A65	A83	B15	B33	B51	B69	C8
A12	A30	A48	A66	A84	B16	B34	B52	B70	D1
A13	A31	A49	A67	A85	B17	B35	B53	B71	D2
A14	A32	A50	A68	A86	B18	B36	B54	B72	D3
A15	A33	A51	A69	B1	B19	B37	B55	B73	
A16	A34	A52	A70	B2	B20	B38	B56	B74	
A17	A35	A53	A71	B3	B21	B39	B57	B75	
A18	A36	A54	A72	B4	B22	B40	B58	B76	

Which article in this issue was of most interest to you? _____

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THESE INFORM-A-GRAM CARDS are for the convenience of *TOOLING and PRODUCTION* readers who, we know, rarely have stenographic help at their beck-and-call while reading. To get further information concerning selected items featured — all one needs is an INFORM-A-GRAM card and a pencil or pen to circle the numbers of the items wanted. If there is no identifying number, use the page number.

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18	36	791	1001	1181	1351	1432	1491	1544	1601	1651	1851	1991	2032	2093	
19	38	811	1011	1191	1381	1441	1492	1551	1602	1652	1861	1992	2033	2101	
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A6	A24	A42	A60	A78	B10	B28	B46	B64	C3
A7	A25	A43	A61	A79	B11	B29	B47	B65	C4
A8	A26	A44	A62	A80	B12	B30	B48	B66	C5
A9	A27	A45	A63	A81	B13	B31	B49	B67	C6
A10	A28	A46	A64	A82	B14	B32	B50	B68	C7
A11	A29	A47	A65	A83	B15	B33	B51	B69	C8
A12	A30	A48	A66	A84	B16	B34	B52	B70	D1
A13	A31	A49	A67	A85	B17	B35	B53	B71	D2
A14	A32	A50	A68	A86	B18	B36	B54	B72	D3
A15	A33	A51	A69	B1	B19	B37	B55	B73	
A16	A34	A52	A70	B2	B20	B38	B56	B74	
A17	A35	A53	A71	B3	B21	B39	B57	B75	
A18	A36	A54	A72	B4	B22	B40	B58	B76	

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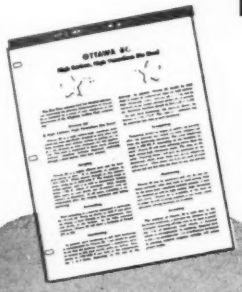
OTTAWA 60

for DRAW DIES is *NEW...and NEWS!*



Write for a copy of the OTTAWA 60 BLUE SHEET

This Blue Sheet contains certified data on the physical characteristics of Ottawa 60, prepared from carefully checked laboratory and field service tests. All the information you'll need on methods of handling and heat treatment, etc.

ADDRESS DEPT. TP-64

In fact, this exclusive Allegheny Ludlum-developed die steel is mighty *good* news for any user of draw dies. Ottawa 60 is a high-carbon, high-vanadium analysis, initially designed for the primary purpose of drawing stainless steel.

In that service, Ottawa 60 does just exactly what it was developed to do: it performs without galling or pickup, and shows exceptional wear-resistance—as a long list of successful applications will prove to you. Two of them are illustrated above: a stainless hinge and a stainless sundae server.

But Ottawa 60 is a top performer on any draw die application! Also illustrated above are the two draws on a transformer housing of .037″ gauge SAE 1010 strip. After more than 25,000 pieces—*over 12 times any previous runs*—there was still no sign of pickup, or of wear on the Ottawa 60 punch or die.

This analysis can solve your draw-die problem jobs—or reduce your costs on almost any drawing operation. ● Call on our Mill Service Staff for any assistance. *Allegheny Ludlum Steel Corporation, Oliver Bldg., Pittsburgh 22, Pa.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

AL® FINE TOOL STEELS SINCE 1854

W&D 5581

CIRCLE INFORM-A-GRAM KEY NO. 1671

it's yours for the asking—it's FREE!

Webber
CROBLOX Gage Block
(regularly sold for $12.62)
size .1005" (certified accurate to ± .000004")

Just send us your old .1005" rectangular block regardless of its age, condition, brand or material (steel or chrome plated).

Reason for this unusual offer is to prove to you, by actual use in your own shop, that Webber CROBLOX Gage Blocks (chrome carbide) are the finest, longest-wearing blocks made.

CROBLOX retains its accuracy many, many times longer than standard steel or plate. The .1005" size was chosen because in most shops it is subjected to the greatest amount of use, and therefore to the greatest amount of wear.

Have your quality control manager, chief inspector, tool room foreman, or an official of your company write us on company letterhead, authorizing this exchange. Then we will notify you when to ship your old .1005" block (requests will be filled in order received).

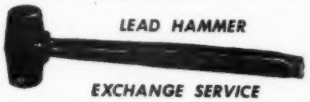
No cost to you—no obligation of any kind. We simply want to prove the superiority of Webber CROBLOX.

Webber
GAGE COMPANY
12903 Triskett Road • Cleveland 11, Ohio

LARGEST EXCLUSIVE MANUFACTURER OF PRECISION GAGE BLOCKS

CIRCLE INFORM-A-GRAM KEY NO. 1681

The Initial Supply of Podlin Lead Hammers are purchased and thereafter the damaged hammers are ex-

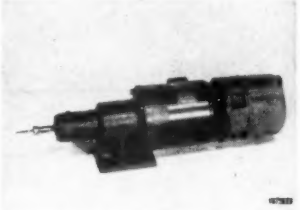


changed for new ones at half the price, from Podlin Tool Co., 11849 Franklin Ave., Bensenville, Ill. The hammers feature a formed handle for comfort and safety.
Circle Inform-A-Gram No. A72.

The "Hefty Holer" heavy duty tool attachment is powered by any electric drill. Tools now available include

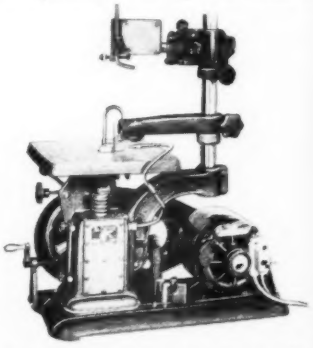
files, chisels, gages, and jig saw blades. Little Beaver Industries, Inc., Willoughby, Ohio, will supply complete information, or—
Circle Inform-A-Gram No. A73.

This Tapping Head now uses the specifically designed Dinabrake motor which has a brake winding for stopping and reversing the tap at the end of the forward stroke, elimi-



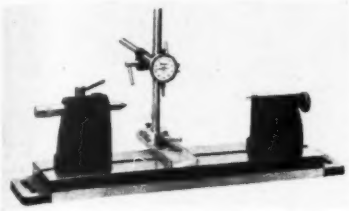
nating an overheated motor when reversed at full speed. Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich.
Circle Inform-A-Gram No. A74.

This Precision Die Filing Machine is adaptable to a wide range of filing, honing, and sawing uses. Infinitely variable speed V-belt type drive permits operations at speeds from 170



to 470 strokes per min. Two adjustable, removable overarms are employed. All American Tool & Mfg. Co., 8039 Lawndale, Skokie, Ill., or—
Circle Inform-A-Gram No. A75.

This Geneva Bench Center Checking Set, featuring a versatile slide with a tip-over upright for loading, straightening, and adjusting work offers indicator attachments for the

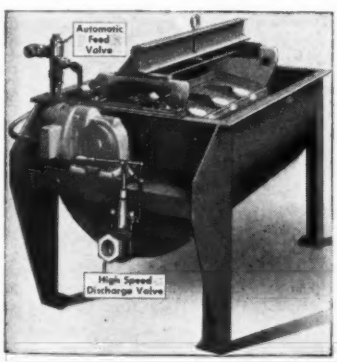


precise checking of all types of materials. Get details and specifications from Chicago Dial Indicator Co., Dep't A, 180 N. Wacker Dr., Chicago, or — **Circle Inform-A-Gram No. A76.**

Two Polishing Oils for use in grinding and finishing ferrous and non-ferrous metals have been developed by D. A. Stuart Oil Co., Ltd., 2727 S. Troy St., Chicago 23, and Minnesota Mining & Mfg. Co., St.

Paul 6, Minn. "Excelene FD" (for ferrous metals) and "Excelene NF" (for non-ferrous metals) are applied to abrasive belts to reduce loading, give longer life, and aid in faster grinding and improved finishes.
Circle Inform-A-Gram No. A77.

Round Bottom Rinse Tanks for plating barrels, developed by Belke, have automatic feed valves and quick-acting dump valves for cleaner, faster rinsing. With these tanks, the fresh water is shut off and the contaminated water is dumped with the



quick-acting valve. When the cylinder comes in place the tank refills with fresh water. These tanks can be furnished for plating barrels of all makes. Belke Manufacturing Co., 947 N. Cicero Ave., Chicago 51.
Circle Inform-A-Gram No. A78.

CAN *You* ANSWER THESE 10 QUESTIONS ON STAMPING?

	YES	NO
❶ Do you ever buy stampings on the outside?	☐	☐
❷ Do your stampings have to be highly accurate?	☐	☐
❸ Do you have more idle press time than you should?	☐	☐
❹ Do you have short runs frequently?	☐	☐
❺ Do you get less tool life than normal?	☐	☐
❻ Do you run into assembly problems due to poor quality stampings?	☐	☐
❼ Do you ever have costly delays due to poor delivery on stampings?	☐	☐
❽ Do you ever run jobs uneconomically because of improper press size or speed?	☐	☐
❾ Do your tools and dies always get expert care from suppliers?	☐	☐
❿ Do you ever worry about high storage costs?	☐	☐

If you get too many "YES" answers to these questions, it will pay you to find out how Laystrom can help change those answers to "NO". We have a complete line of presses from 5 to 250 ton for any job from one to a million pieces. We can assure prompt delivery, high stamping quality, and expert maintenance of your dies. We can economically furnish short or long runs — no job is too small. Let us quote on your next job. Send your drawings to Laystrom Manufacturing Company, 2005 North Parkside, Chicago 39, Illinois.

LAYSTROM MANUFACTURING COMPANY
2005 North Parkside • Chicago 39, Illinois

● **Please send us complete brochure covering Laystrom production services to industry.**

Name_____
Title_____
Company_____
Address_____
City_____ State_____

☐ We are sending drawings for quotation.
☐ Have salesman call.
☐ Send brochure only.

LAYSTROM

TOOLS • DIES • ASSEMBLIES • PARTS DESIGN • SHORT-RUN DUPLICATING
Manufacturers of the Layco Tru-Align Die Setup

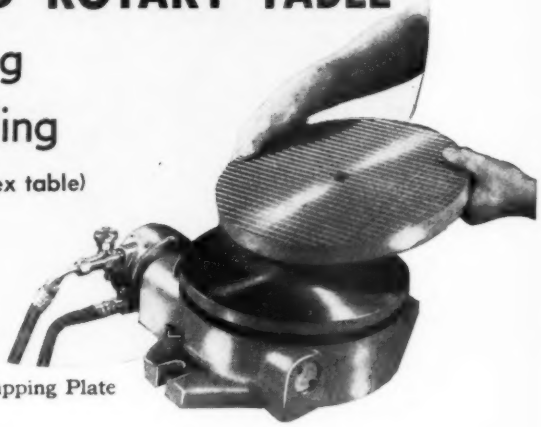
CIRCLE INFORM-A-GRAM KEY NO. 1691

With Permanent Magnetic Chuck

NEW Vulcan MOTORIZED ROTARY TABLE

for lapping and grinding

(not an index table)



With Lapping Plate

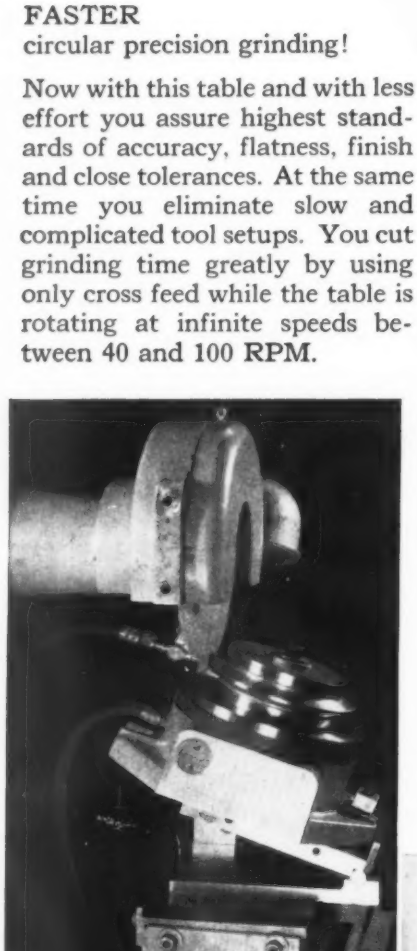
FASTER
circular precision grinding!

Now with this table and with less effort you assure highest standards of accuracy, flatness, finish and close tolerances. At the same time you eliminate slow and complicated tool setups. You cut grinding time greatly by using only cross feed while the table is rotating at infinite speeds between 40 and 100 RPM.

For example, Vulcan's Rotary Table can be used in connection with a sine plate or angle fixture. The dressing of large expensive external wheels for side grinding is therefore eliminated. If you wish we can provide permanent magnetic chucks designed for use with our table, both 6″ and 10″ in diameter.

Vulcan's Rotary Table is an air operated, self contained unit, portable between bench or machine. A precision center hole for locating and tapped holes in the table for clamping provides easy setup. Circular surface grinder applications are many and varied — grind flanged studs or bushings — bearing spacers — forming rolls — cutters — convex or concave surfaces — punches or dies (radius or angle).

Lapping? Yes — and in micro inches. For the 6″ and 10″ table, lapping plates of 12″ and 16″ are provided. Perfect for lapping valve plates, gages, bearing spacers and for carbide lapping using diamond powder. *Write for circular.*



Work clamped to motorized table, mounted on sine plate. Surface grinder application.

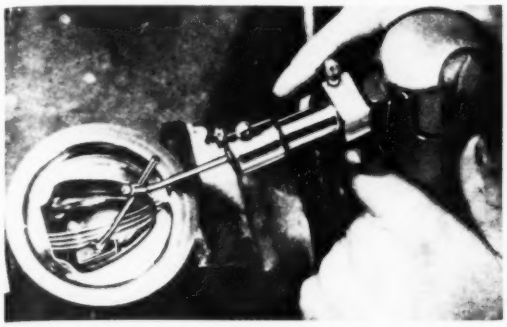
Major Vulcan Services

Engineering, Processing, Designing and Building . . . Special Tools . . . Dies . . . Special Machines . . . Vulcamatic Transfer Machines . . . Automation . . . including the Vulcan Hydraulics that Form, Pierce, Assemble and size. Vulcanaire Jig Grinders . . . Motorized Rotary Tables . . . Plastic Tooling.

VULCAN TOOL CO.
20 PRITZ STREET • DAYTON, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 1701

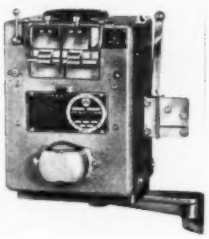
Model FNC Pi-Profiler, which can be used with any suitable flexible drive and without an intermediary sleeve coupling, is a product of the Engis Equipment Co.,

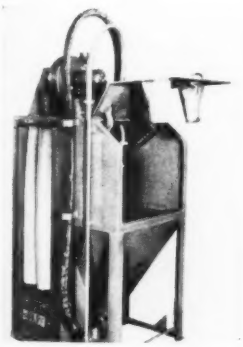


431 S. Dearborn St., Chicago 5, Ill. This reciprocating hand machine for cutting, roughing, and finishing has become an important instrument for die, tool, and mold making; precision fitting; and tool maintenance. Complete descriptive literature and price lists are available.
Circle Inform-A-Gram No. A79.

A Constant Flow of Air, free of dust and water droplets for longer periods of operation, is promised by a mechanical filter by the Porous Plastic Filter Co., Glen Cove, N. Y. The "heart" of the "Dri-Kleer" filter is a permanent core or cartridge of "Teflon" felt which is chemically inert and water repellent. Its water repellency prevents the accumulation of water and permits a high air flow rate.
Circle Inform-A-Gram No. A80.

Butt-Welding a Band Saw Blade takes less than two min with the new ¾" capacity Band Saw Welder by The Walker-Turner Div'n of The Kearney-Trecker Corp., Plainfield, N. J. Features include adjustable heavy duty blade clamps with cam locks and built-in flash grinder.
Inform-A-Gram No. A81.





Combining a Blast Cabinet and Dust Collector in minimum space, this Sly "Blast-Filter Combo" offers advantages never before obtainable in cleaning small metal parts in machine shops, tool and die shops, etc. The compact unit can be adapted to soft grit blasting. Get complete information from The W. W. Sly Mfg. Co., 4700 Train Ave., Cleveland, Ohio, or—
Inform-A-Gram No. A82.

Rectifier Welder. This new 300 amp DC selenium rectifier type arc welder with remote control is a product of Hobart Brothers Co., Troy, Ohio. A wide welding current range of 35 to 425 amps is provided for use with a variety of electrode sizes for repair, maintenance, and production welding.
Inform-A-Gram No. A83.

Ren•ite PLASTIC TOOLING NEEDED TO COMPETE TODAY

Take the case of this automotive body with Master Keller Models in cubed position

TOOLING TIME CUT AS HIGH AS 70%

A definite proof of Ren-ite Plastic Tooling doing a job better. This builder of fine cars accepted the challenge of higher production at lower production costs. Savings in tooling costs plus faster checking operations have helped to hold the price line on this 1955 car.

Check Your Tooling Costs . . Investigate Ren-ite Plastic For the LOW COST ANSWER

Ren-ite is the dimensionally-stable tooling plastic of Thermosetting Resin used as a laminating or casting plastic without application of heat or pressure. For Keller models . . . duplicators . . . spotting racks . . . draw dies . . . drop hammer dies . . . core boxes . . . drill fixtures and new ones are being developed each day.

FREE ENGINEERING SERVICE
NO CONTRACT REQUIRED

Ren•ite PLASTICS, INC.

3179 South Cedar Road, Lansing 4, Michigan
Offices in Chicago, Cleveland, Detroit, Los Angeles, New York and St. Louis

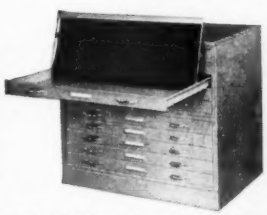
CIRCLE INFORM-A-GRAM KEY NO. 1711

MAYLINE

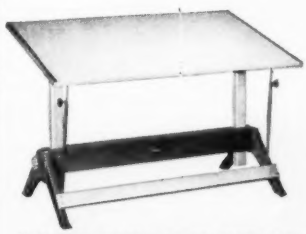
OUTSTANDING DRAFTING FURNITURE AND EQUIPMENT

4-POST TABLE WITH DRAWERS

High grade materials and fine workmanship combine to make MAYLINE products outstanding in quality and price. Your inquiry will bring Catalog 8-A.



PLAN FILE WITH HINGED COVER



Symbol of MAYLINE Superiority

MAYLINE CO.
635 No. Commerce St.
Sheboygan, Wisconsin

V-MODEL TABLE WITH FOOTREST

MAYLINE

CIRCLE INFORM-A-GRAM KEY NO. 1712

NOW

a better product made BETTER

WITH THESE ADDED NEW FEATURES:

1 ADJUSTABLE TAKE-UP TO ELIMINATE END-PLAY IN FEED SCREW ASSEMBLY. BACK-LASH CAN BE TAKEN UP INSTANTLY

2 AND — TALK ABOUT LARGE OFFSET! OUR SMALLEST MODEL HAS ¾ IN. OFFSET AND OUR LARGEST MODEL HAS 4½ IN. OFFSET.

ALL in 1 Toolhead

BORING
FACING
TURNING
GROOVING
UNDER-CUTTING

A Model For Any Size Machine

PLUS-

POWER FEED for FACING and GROOVING

Think THAT Over!

WRITE for our New Catalog with complete information and prices!

CHANDLER TOOL CO.
Muncie, Indiana, U. S. A.

A Boring Head That Won't Face is NOT Complete

Chandler-Duplex

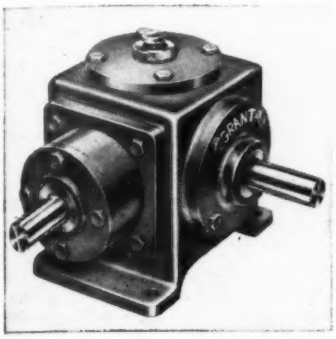
COMBINED BORING AND FACING TOOLHEADS

CIRCLE INFORM-A-GRAM KEY NO. 1721

"Tork-O-Stat" overload protective coupling is used between any drive shaft and a driven shaft, giving instant protection against overloads

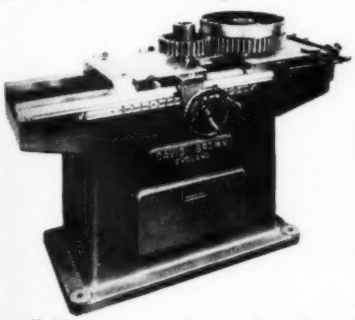
and sudden jams. The instrument re-engages automatically when the overload cause is removed. Machine Accessories, Dep't M274, 6 E. Franklin Ave., Minneapolis 4, Minn., or—
Circle Inform-A-Gram No. A84.

Gear Roll Tester. Concentricity, tooth contact, center distance, and varying tooth thickness of gears up to 24" are rapidly and positively checked on this David Brown No. 24



gear roll tester now distributed by Morey Machinery Co., Inc., 383 Lafayette St., New York 3, N. Y. Readings are registered on the dial indicator and center distances are read directly from a vernier scale.
Circle Inform-A-Gram No. A85.

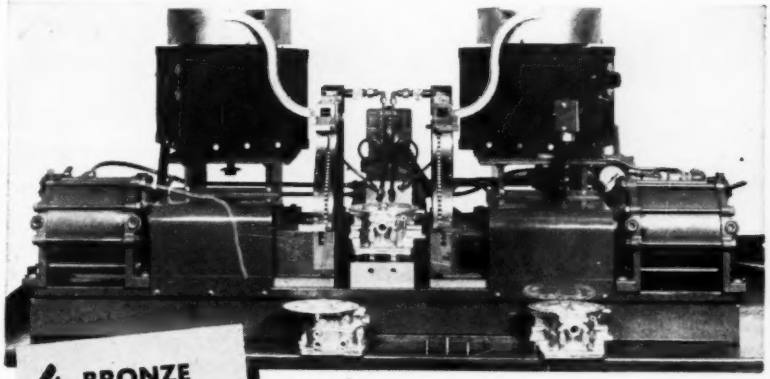
A New Right Angle Drive has been added to the line of products of the Grant Gear Works, Inc., 419 Commonwealth Ave., Boston, Mass. Model RA 225 miter gear drive is



available with a standard ratio of 1-to-1 and furnishes up to 2 hp at 1800 rpm. It may be furnished with right-hand, upward, or downward extension, hardened gears, or special ratio.
Circle Inform-A-Gram No. A86.

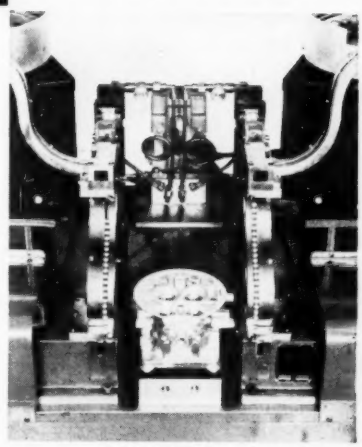
4 to 1 PRODUCTION

4 to 1 Time Saving!...
4 to 1 Cost Reduction!...4 to 1 Labor Saving!
OVER PREVIOUS *Hand* PRODUCTION!



4 BRONZE BUSHINGS INSERTED INTO 4 BARREL CARBURETOR CASTINGS—

Using **DPS VIBRATORY BOWL FEEDERS**



● The bushings are fed from two DPS Bowl Feeders and transferred into four opposed tracks, bringing the bushings into alignment . . . Operator simply places the castings over locating pins in the fixture and cycles the machine by means of a foot switch. Air actuated rams come forward, pick up two bushings on each side and press them to the proper depth with one stroke, previously an individual hand operation. Machine cycle, two seconds.

How about YOUR Assembling Method?

● DPS has solved this and thousands of other bottlenecks through the use of their POWER SCREWDRIVERS, PARTS FEEDERS and SPECIAL MACHINES. We can do the same for you. Tell us your problem.

DETROIT POWER SCREWDRIVER CO.
2827 W. FORT ST. DETROIT 16, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1731

NEW METHOD *Reduces Precision Riveting Costs*

by Clinton A. Bay
Tool Engineer,
Manufacturing Research and Development Section,
CONVAIR — FORT WORTH,
Tooling Department

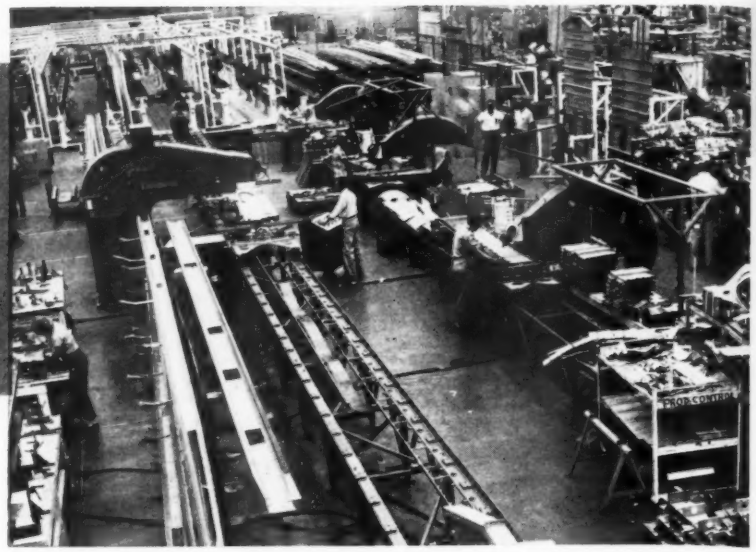


Fig. 1. Large assemblies for riveting, that cannot be handled manually, are positioned on the General Riveters Drivmatic machine by automatically controlled equipment. Here a 43′ spar is shown on a clean-up rack after being riveted. The machine is operated by push button control; precision riveting position is accomplished by the use of perforated tape; and the retracting pressure foot clears structural members of the upper surface of the assembly.

RIVETING has long been recognized as the most expensive operation in the assembly of an all-metal aircraft. The B-36 intercontinental bomber was put together with an estimated 3,200,000 rivets, screws and bolts. Installation of these fasteners required over 15,000 man-hours per ship and an investment of $3,500,000 in riveting guns, bucking bars, drills, squeezers, etc.

Initial Research on Automatic Riveting

Starting four years ago, considerable research was spent in developing methods and equipment to reduce costs and increase the quality production of riveted assemblies. Emphasis was placed on automatic riveting. Convair-Fort Worth was among the first to use automatic positioning equipment with the General Riveters Drivmatic G39A. They were the first to adapt to automatic riveting, the amplidyne system, the perforated tape, photoelectric cell spacer, and the three-dimensional cantilever positioning carriages.

Although less than 12% of applicable B-36 assemblies were reprocessed to automatic riveting, the resulting savings proved these methods should be used more extensively on future contracts. On present contracts 70% of the fasteners are being installed by either automatic or semi-automatic methods.

While economics are of prime importance, quality and precision have also become major factors in the selection of automatic riveting. Close tolerances are no longer adequate. Precision has become the "watch-word" in the fabrication of supersonic aircraft. Precision in assembly is mandatory if the aircraft is to attain design performance specifications.

Converting the Unfeasible to Feasible

In the design and fabrication of the new supersonic B-58 bomber at Convair-Fort Worth, it became essential that perimeter ordinates of many riveted assemblies be held to tolerances of a ± 0.004". Unfeasible! Yet a feasible method had to be developed.

Actually there were two known methods of accomplishing this precision in structural assemblies:

1. To build the assemblies with an excess of material, and then employ perimeter milling to the desired size and shape.
2. To contain and restrict all detail parts in place throughout the assembly procedure, minimizing the conventional "growth" to tolerance requirements.

Perimeter Milling vs. Precision Riveting

Initial investigation of these two alternatives disclosed perimeter milling would consume three times the present maximum machine shop capacity and manufacturing costs would be exorbitant. There was also a high potential of machining spoilage to haunt us.

As most of the assemblies were riveted, it was decided to attempt the development of a means for restricting those phases of riveting that were instrumental to growth.

. . . *Continued on page 176*

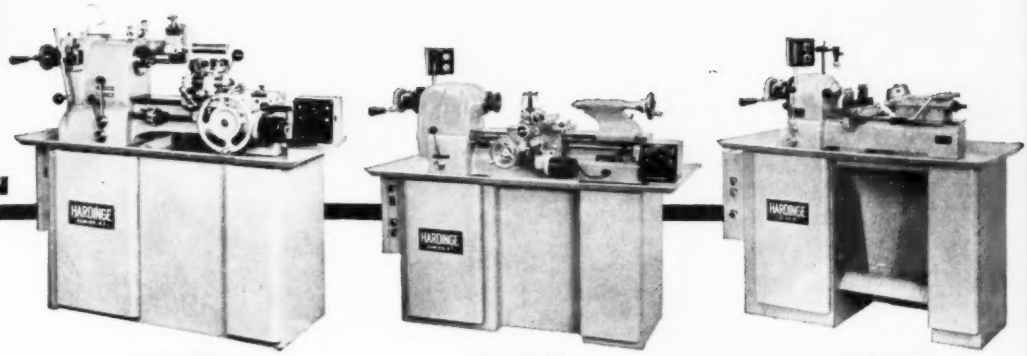
TABLE I

Method	Max. Ordinate Variation	Min. Ordinate Variation	Avg. Ordinate Variation	Percent Bad Rivets	Percent Bad Holes
Hand Bucking	+ .035	+ .007	+ .029	4%	60%
Compression Squeezing	+ .007	+ .002	+ .004	2%	20%
Erco	+ .005	+ .0005	+ .002	.5%	.5%
Drivmatic	+ .005	+ .0005	+ .0015	.5%	.5%

PRECISION PRODUCTS

HARDINGE
ELMIRA, N.Y.

PRODUCTION MACHINES

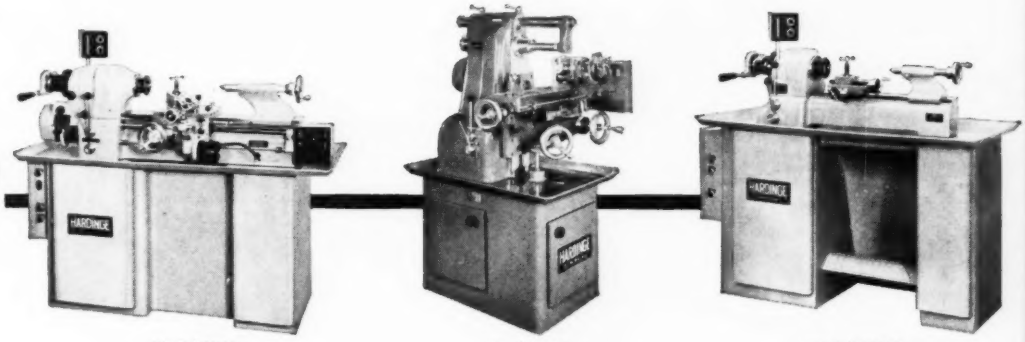


Model HCT
Chucking Machine
with Threading Head

Model TFB
Turning, Facing
and Boring Machine

Model DSM59
Second
Operation Machine

TOOL ROOM MACHINES



Model HLV
Tool Room Lathe

Model UM
Universal Milling Machine

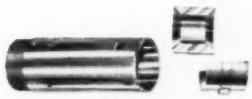
Model DV59
Lathe

HARDINGE COLLETS— FEED FINGERS—PADS

For All Lathes
Millers - Grinders

For All Automatics
Chucking Machines and Turret Lathes

Adjustable Tension
Master Feed Fingers



Style "B"
Master Feed Fingers

Style "S"
Master Collets

HARDINGE-SJOGREN SPEED COLLET CHUCKS

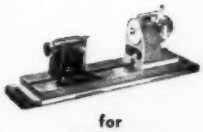
for Cam-Lock
Spindles

for Tapered
Key-Drive Spindles

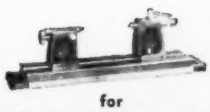
for Threaded Nose
Spindles

for American
Standard Spindles

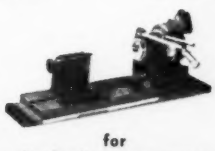
HARDINGE COLLET INDEX FIXTURES



for
Tool Room



for
Inspection Departments



for
Production Departments

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

. . . New Method, from page 174

The investigation of this problem was assigned by Ralph A. Fuhrer, chief tool engineer, to his assistant, G. R. Gordon, who directs the manufacturing research and development effort for Convair-Fort Worth tooling activities.

Variables in Rivet Driving

Initial investigation revealed that inaccurate fixture location, non-positive clamping action, misaligned holes, oversized holes, and over-driving of rivets, were the principal variation factors. Of these, improper rivet driving was the most common contributor to variation.

The first corrective step taken was the establishment of automatic riveting to eliminate misaligned holes and the over-driving of rivets. A series of tests were run wherein identical parts were assembled by conventional hand bucking; by compression squeezing; by Erco riveting machine; and by General Riveters Drivmatic riveter. The prototype assembly was a standard wing rib, consisting of web, angle stiffeners, and upper and lower spar caps. A total of 235 rivets were installed per assembly and results checked at 16 perimeter points with the results shown in Table 1.

Hand riveting was accomplished employing semi-skilled labor. All parts were located in a fixture, hole pattern was laid out, holes drilled, assembly dismantled, deburred, reassembled in fixture, Clecq'd, removed from fixture and bench riveted. The ordinate variation was comparable to previous findings on former contract production.

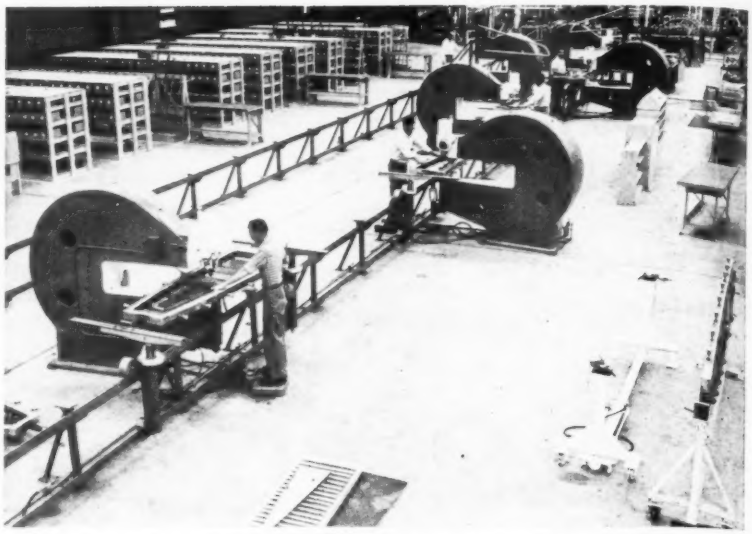


Fig. 3. Mobility of the workpieces while still in the fixtures is evidenced by this line of Erco riveting machines. The picture-frame fixtures travel along the track from machine to machine. The work is moved into riveting position by means of the transverse carriage bars.

Determination of bad rivets included rehits, as well as replacements. Holes were inspected to a + 0.004" or — 0.002" tolerance. It was found that after a few rivets had been driven, expansion of material in the lighter-gauge detail parts caused misalignment of the balance of open holes. These had to be cleaned out by additional drilling before insertion of rivet could be made. This method had heretofore been standard shop practice and was acceptable on previous contracts. It is not a recommended procedure for highly stressed structures.

Applying the Squeeze—to Rivets

The squeezing method was processed similar to the hand riveting in all but the heading of the rivets. Heading was accomplished on a Chicago Pneumatic No. 625 rivet squeezer. Ordinate tolerances were improved due to controlled heading pressure. Fewer holes had to be cleaned out for rivet admission due to controlled heading. The insertion of numerous rivets prior to heading operations was feasible.

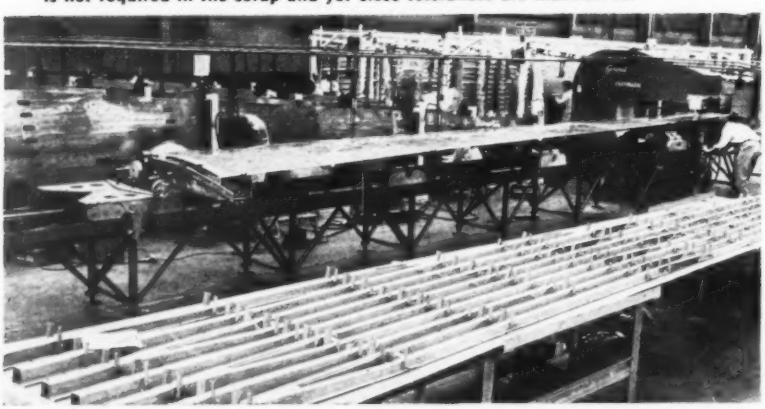
Automatic riveting produced the best results and assembly growth was minimized, thus meeting requirements. The percentage of bad rivets and bad holes was comparable to previous findings on former contract production. It was determined from previous experience that ordinate tolerances could be maintained only by retaining all detail parts in clamped position throughout the complete assembly process.

Tolerances vs. Fixturing

It was later found that although the assembled part was within allowable tolerances established by the fixture, the assembled part was not within the ordinate dimensions established by Convair's engineering department. The discrepancy existed in the basic inaccuracy of the type of tool used, a conventional fixture for the Erco riveting machine. It became a necessary part of the problem for manufacturing research and development to devise a type of fixture that

. . . Continued on page 178

Fig. 2. An 11-to-1 reduction in man-hours is effected by the use of the Rivmatic machine to drill, countersink, and feed and head 5000 flush rivets in this outer wing panel. The customary shaving of protruding rivet heads is not required in the setup and yet close tolerances are maintained.



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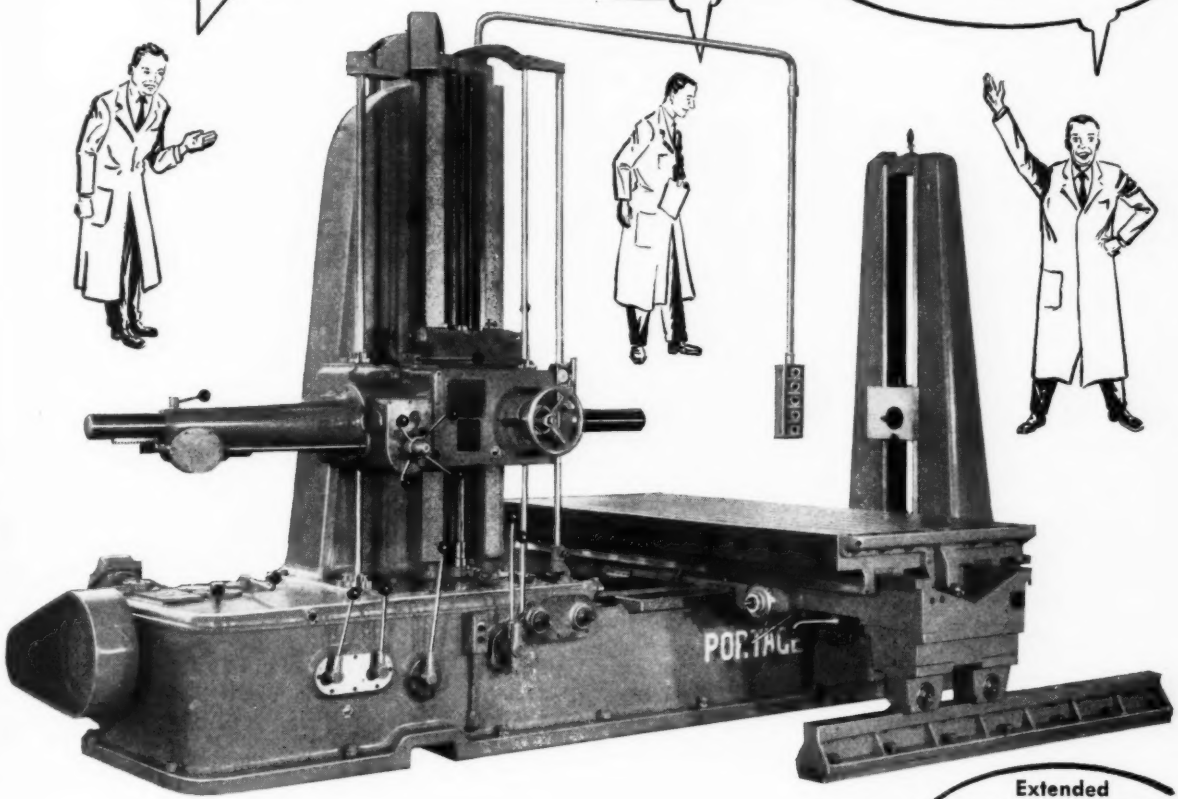

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. . . New Method, from page 176

would incorporate all of the following features:

1. Locate and secure all detail parts accurately and consistently throughout the assembly operations.
2. Provide stops, locators and other positioning devices that could be readily set to an accuracy of ± 0.002".
3. Ready mobility from station to station or from machine to machine.
4. Ready access to all working areas.
5. Economy of fabrication.
6. Economy of work area consumption. (A fixture that could either be stacked on the floor or stored in shelves when not in use would be more desirable.)
7. A fixture that could be made from a basic sketch rather than an individual design.
8. Details that would be reusable for future work.
9. Adaptability to automatic, semi-automatic or manual riveting processes.

Tests were made to determine the comparative costs and accuracy of several types of riveting fixtures. The results of these tests are posted in Table II.

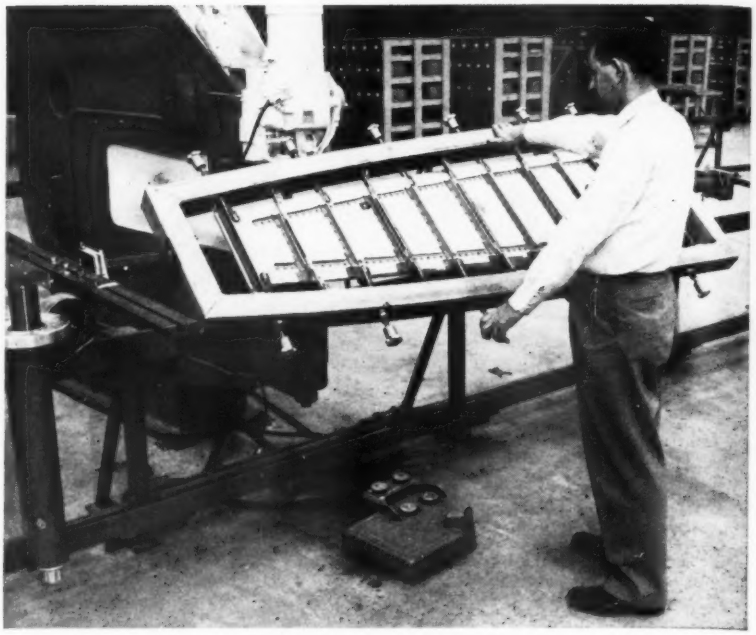

Fig. 4. J. D. Hudson, assistant foreman in major assembly area at Convair, demonstrates the ease of maneuvering the workpiece as it is held in the picture frame fixture by the specially-developed Siewek clamps. The hook type clamp adaption is holding the chord angle against the locator. Due to the track and the carriage cross bars, the operator can move the fixture by mere fingertip effort in either a lateral or transverse direction. Fixtures as long as 17' and weighing over 200 lbs are being handled manually at Convair-Fort Worth. When hand tool operations or manual riveting are called for, the workpieces remain Siewek-clamped in the picture-frame fixtures which are then mounted on adjustable trunnion stands as shown in right foreground of Figure 3.

Fixture Selection

The selection of a type fixture was relatively easy. The "picture frame" type of structure has long been common and popular to the aircraft industry. Mounted on trunnion posts, this type fixture provides ready access to all work areas, is economical to build, has wide adaptability, and can be readily made from a basic design sketch. By mounting the trunnion post holders on carriages, and by reducing the fixture weight through the use of aluminum structural materials, good mobility was obtained. This reduction in fixture weight also made feasible their storing in stacks or on racks when not in use. This storing method permits a reduction of 75% in manufacturing area consumption.

Clamps and Locators

Clamps and locators were the paramount problem. They had to be precise yet economical, compact yet sturdy, and accurate yet adjustable. A market survey failed to disclose a standard purchasable item. The Siewek Tool Company of Detroit suggested we furnish them our requirements. Their problem was to build a clamp to these requirements while utilizing existing standard parts.

The specifications were:

1. To combine clamp and locator into one unit, minimizing obstruction to the working area and assuring accuracy of position.
2. To mount this unit through the fixture frame structure rather than on top or below. This locating would give greater machine throat clearance, better rigidity and economy of operation.
3. The hook and locator units should be made interchangeable to correspond to the design of the work.

Three variations of the clamp were made by Siewek before a unit was found acceptable. This clamp fulfills all requirements. It supports the work, locates the mold line (ML) to precision tolerances and securely clamps the parts in positive position. The initial cost of these clamps is comparable to that of conven-

. . . Continued on page 180

TABLE II

Type of Fixture	Design Costs	Fabrication Costs	Material Costs	Weight	Accuracy
Table Top	47 hrs	151 hrs	$295	370 lbs	± .015
"A" Frame	51 hrs	187 hrs	$310	350 lbs	± .015
Plate Masonite*	4 hrs **	64 hrs	$115	140 lbs	± .009
Picture Frame (Steel)	6 hrs **	115 hrs	$420	185 lbs	± .004
Picture Frame (Aluminum)	4 hrs **	81 hrs	$434	70 lbs	± .002

*This fixture was basically a sheet of masonite with cut-outs for the rivet pattern and stop blocks for locators. Clamps were springs which held the parts against the locator blocks. Made from a basic design sketch, these fixtures were very accurate, yet economical to build, but required an excessive amount of time to set up and load. Continued usage loosened the stops and locators and accuracy diminished.

**These hours are pro-rated from the design time on the basic fixture.

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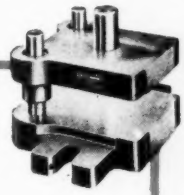

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. . . New Method, from page 178

tional clamps, yet the added durability and re-useability makes their ultimate cost less.

Where a web with intermediate stiffeners is being built, a template or platen is suspended inside the fixture frame on cross ties. Cut-outs in the template provide a nesting type of location for detail parts. Pilot holes and guide slots are cut through the template for locating the riveting machines.

Rivets, inaccessible to the riveting machine, are drilled by hand and squeeze set. Pilot holes are made oversize, requiring removable drill adapter bushings. After drilling, the bushing is removed and room is available to insert and drive the rivet within the fixture. This same method may be employed to assemble the complete assembly manually.

The development of this fixture fulfilled Convair's requirements for accurate tooling at reasonable cost.

Attaining Production Economies

The next phase of the development program was to furnish our manufacturing activity with a process effecting economy in production. Although automatic riveting will average 11 rivets for every one drilled and driven manually, the frequent setup changes for differences in rivet sizes, nullifies this advantage. It has been a general practice in the aircraft industry to group several machines together, setting each machine for a specific rivet diameter. The manual movement of parts from one machine to another is feasible and practical; the manual movement of parts and their fixture is not.

Work Flow and Mobility

A work supporting and positioning carriage, mounted on vertical tracks, was developed to aid the production departments in moving both fixture and parts with convenience and economy.

The carriages, cantilever in design, have the following characteristics:

1. A minimum of weight.
2. Clearance of carriage and work through throat of machine.
3. Transverse positioning travel.
4. Lateral positioning travel.
5. Adjustability for height.
6. Flexibility of usage.
7. Economy of installation.

The vertical tracks have the following characteristics:

1. Requires a minimum amount of floor space.
2. Flexibility of usage.
3. Economy of installation.
4. Economy of construction.

These carriages and tracks have proven to be efficient for the initial installation. Two tracks, 115' long, were set directly opposite and parallel to one another. The first track starts from the fixture storage area, runs alongside the production part detail stock bins and past one automatic riveting machine. The other track runs in front of five additional riveting machines, three facing eastward and two westward. Beyond these are two Chicago Pneumatic 625 squeezers likewise facing each other. At the end of the track is a cleanup area, complete with all necessary portable pneumatic hand tools.

Transfer gates at each end of the tracks permit the unit movement of carriages, fixture, and parts from one track to the other.

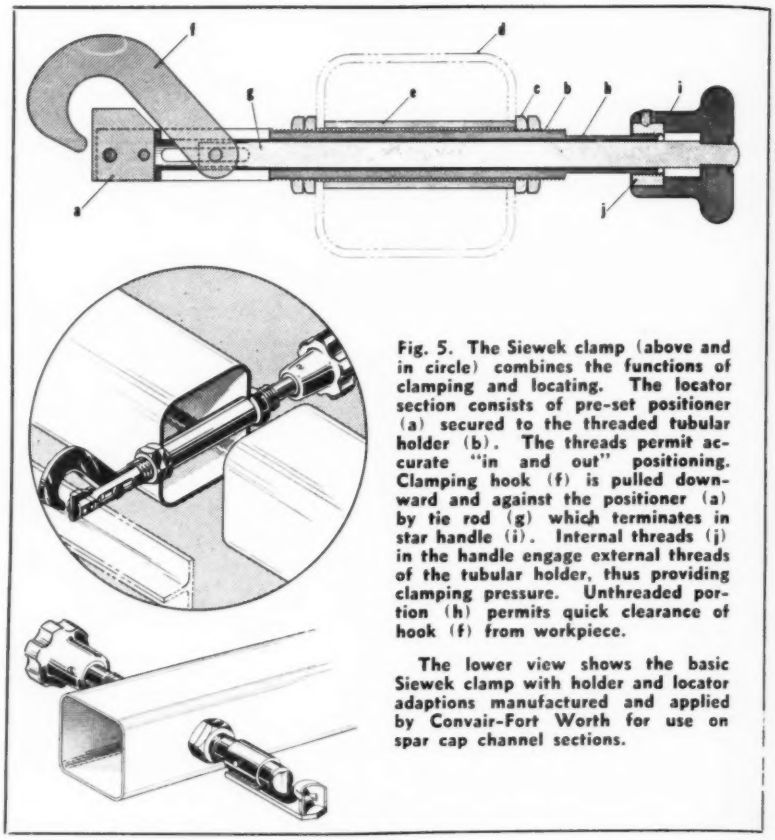


Fig. 5. The Siewek clamp (above and in circle) combines the functions of clamping and locating. The locator section consists of pre-set positioner (a) secured to the threaded tubular holder (b). The threads permit accurate "in and out" positioning. Clamping hook (f) is pulled downward and against the positioner (a) by tie rod (g) which terminates in star handle (i). Internal threads (j) in the handle engage external threads of the tubular holder, thus providing clamping pressure. Unthreaded portion (h) permits quick clearance of hook (f) from workpiece.

The lower view shows the basic Siewek clamp with holder and locator adaptions manufactured and applied by Convair-Fort Worth for use on spar cap channel sections.

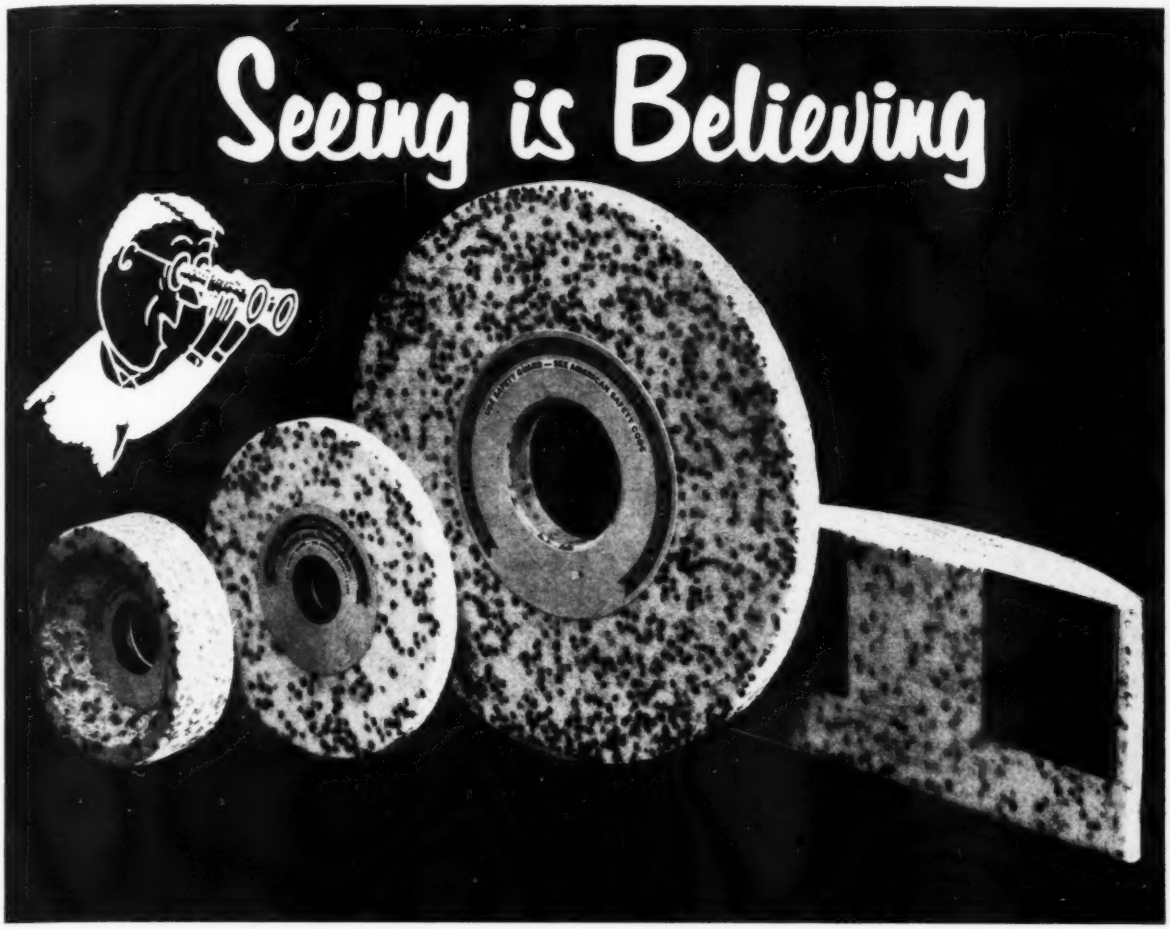
TABLE III

Work Operations	Conventional Method	Automatic Method
Loading of detail parts onto fixture	.20	.20
Riveting of webs to stiffeners	1.20	.67
Riveting of webs and stiffeners to chords	.50	.18
Riveting of webs to chords	1.18	.42
Cleanup	1.00	1.00
TOTAL	4.08 hrs	2.47 hrs

Assembly Sequence and Inspection

Each assembly follows a basic pattern of sequential operations; minimizing handling, personnel, and working area. The fixtures

. . . Continued on page 198



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CIRCLE INFORM-A-GRAM KEY NO. 1811

How To Protect Precision Parts Until Ready for Use

by Lyne S. Metcalfe

New York, N. Y.

EVER SINCE TECHNOLOGY made possible production of machined and precisioned metal parts and products, means were sought to give protection to outer surfaces . . . from injury by corrosion, by humidity, by abrasion, by salt water, and by ordinary rough handling.

Particularly has exposure of **precision** parts to such hazards been costly and numerous attempts have been made to give the needed protection, namely, through application of grease, oils, metal, wax paper, and even wood protective coatings. In many instances these protective measures and materials have served well; but the increasing tempo and complexities involved in machining, fabricating and/or finishing of precision parts and products has brought a demand — first, for greater protection, and second, for a method that is economical and quick to apply, as well as easy to remove at the moment of use.

Not only is this protection needed in transit and long term storage, but parts are often exposed to certain of these destructive elements in ordinary interplant transfer of products and parts.

It is natural that something should be developed which fully meets the requirements as outlined above, and such a method is now being used with success in many industries and especially in metalworking plants.

The bases for these strippable plastic coatings are two well-known materials, ethyl cellulose and cellulose acetate butyrate. These materials are used separately to formulate a series of coatings with different characteristics for different applications.

The usable coatings themselves are formulated from ethyl cellulose or cellulose acetate butyrate, resins, plasticizers, stabilizers and anti-corrosive oils, etc. The resultant film is from 0.05" to 0.1" thick and is transparent and pliable. This coating becomes what amounts to an integral part of the finished coated article until the latter goes into use, at which time the coating is quickly and easily peeled or stripped off. This leaves the finished surface undamaged, ready for use — no cleaning or treatment of any kind being needed before use after the coating is stripped off.

Now, what really are these "enemies" of metal parts and products lying in wait during storage and shipment? It is probable that the degree to which they destroy the surfaces of such

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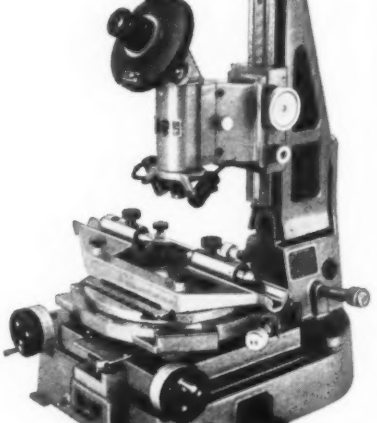

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materials is somewhat underestimated by the average manufacturer, who may feel that little damage can happen to his product between the time it leaves his plant until it is put into the final production line.

Of course, everyone knows the destructive force of corrosion and rust, and this is the chief enemy of metal parts and products — one which must be guarded against. The strippable coatings described here give protection against it, due to rust-inhibiting oils that are included in this type of parts coating and give the plastic its "oil-feel".

Also, the glove-tight fitting nature of the applied coating keeps out most harmful moisture. Also, the fact that the coating is applied at a heated stage tends to discourage the presence of moisture. After ten years of practical tests, we have more than sufficient evidence that these coatings provide adequate protection against rust and corrosion.

The need for clean surfaces in using metal parts on any assembly job is well enough known, pointing to another advantage of strippable coatings in that they protect the parts surfaces from all possible contamination.

On the other hand, materials of all types are pretty apt to be roughly handled these days even in inter-plant conveyance and, thus protection against abusive handling is another important function of the coatings.

The film over the part cushions the surface against chipping, denting, or scratching. The fact is that the finest precision instrument parts have been coated and then shipped in outer coverings and found free of all surface blemishes at the end of the storage or shipping period.

Inasmuch as the curious can see every detail of the coated object through the plastic film coating, protection is assured from tampering while the parts or materials are enroute.

The successful application of peelable plastic coatings depends on its intelligent use on properly prepared surfaces. As in the case with any packaging material — be it paper, wood, wax, grease, oil, or metal, the nature and properties of the material must be understood and the packaging operation specifically designed with the properties of the material in mind. Wood is wood and cannot be drawn or beaded. Paper, wax, grease, and metal all have their limitations. And so, of course, do the peelable plastic coatings.

The condition of the part prior to dipping is of importance because the coatings will preserve the part in the same condition as when it is dipped. It must be absolutely free of rust, cleaning compound and moisture, with only preservatives or operational lubricants present.

Experience indicates that, of the various recommended cleaning methods, vapor degreasing

. . . *Continued on page 186*

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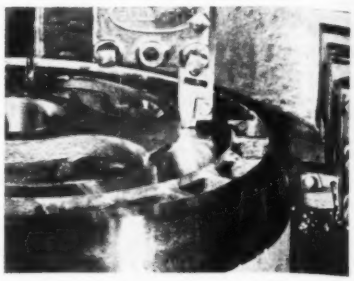
PROPER GRADE OF CARBIDE DETERMINES MACHINING COSTS

Use of a proper carbide grade cutting tool with proper nose radius to meet specific machining conditions can bring about considerable savings to the user. This was demonstrated recently in dollars and cents by a mining machine manufacturer, when a carbide cutting tool change on a tough machining job dropped over-all machining costs by almost 70%, based on 15 pieces machined.

The cutting tool substituted on the job, Carboloy grade 370 carbide, made by Carboloy Department of General Electric Company, reduced machine downtime costs from $60 to $1, regrinding costs, $30 to nothing.



Nine cuts without any appreciable wear are made with this Carboloy grade 370 carbide tool. Previously, as many as 16 clamp-on type carbide tools were needed to make a single facing cut.

Only two grade 370 carbide tools, costing $28.68, were used on the job as against 16 of the previous tools required.

The work in this plant consisted of machining, on a 42" Bullard, the combination clutch and brakedrum used for power shovels. The part is of 1045 low carbon, high manganese cast steel with a hardness of 40 scleroscope. The job involves cutting through multiple sand inclusions and across heavy interruptions.

In the facing operation, the machine is run at 24 rpm with a feed of 0.018" to 0.033" and 3/8" depth of cut.

The grade 370 standard carbide clamp-on tool, unaltered except for a 3/16" nose radius, produced nine cuts without showing any appreciable wear.

Here's how comparative costs broke down, based on machining 15 parts.

For previously used carbide:

1. Cost of tools—nothing. They were in stock.

2. Number of tools necessary, estimated at 4 per workpiece, 60 (as high as 16 used to make one cut)—4 tools for each of 15 pieces.

3. Cost of regrinds—59 regrinds, 5 min each at $5 per hr, $30.

4. Cost of machine downtime—59 tool changes, 3 min each at $20 per hr, approximately $60.

Cost of using previous carbides for machining 15 pieces, $90.

Cost of machining with Carboloy grade 370 carbide:

1. Cost of two grade 370 tools—$28.68.

2. Cost of regrinds—nothing.

3. Cost of machine downtime (1 change at 3 min) $1.

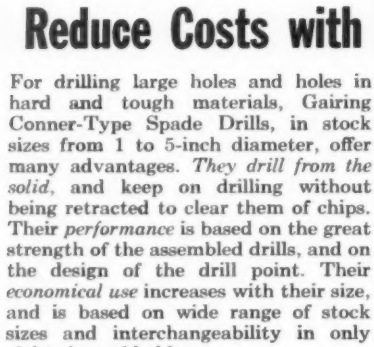
Total cost of machining 15 pieces with two grade 370 carbide tools, $29.68.

Reduce Costs with Gairing Spade Drills

For drilling large holes and holes in hard and tough materials, Gairing Conner-Type Spade Drills, in stock sizes from 1 to 5-inch diameter, offer many advantages. *They drill from the solid*, and keep on drilling without being retracted to clear them of chips. Their *performance* is based on the great strength of the assembled drills, and on the design of the drill point. Their *economical use* increases with their size, and is based on wide range of stock sizes and interchangeability in only eight sizes of holders.

Spade Drills Have Greater Strength

The spade drill below shows heavy cross sectional strength along a direct line between drill point and shank.



Compared to a twist drill, this design provides great resistance to *end thrust* (for better drilling from the solid), to *torque* (to lessen chipping and breaking through vibration), and to *bending*.

Drill Point Designed for Hard Work

Spade drill cutters are furnished finished ground with these features: *small dead center* minimizes end thrust, *cutting angles* (point angle and rake) provide better support of cutting edges, *chip breaker grooves* keep chips narrow, *chip curls*, ground parallel to cutting edges, break chips short.

A Rugged Tool for General Work

A rugged tool for all large hole drilling in tool rooms and tool and die shops and for shallow production drilling, where coolant can be applied in the conventional way, is shown at the left.

A Tool for Continuous Production

Oil hole drills, rotating or designed for the turret lathe, flush chips from the bottom of deeper holes on production work. Many such drills, like the one shown above with a special oil inductor holder, are made larger than standard for special applications.

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GROWING PAINS

Sandvik Steel, Inc., suppliers of specialty strip steels, is now building an 85,000 sq ft plant in Fair Lawn, N. J., which will consolidate the company and its four divisions in one central location. Facilities will be provided at the new plant for rolling and slitting strip steel, manufacturing springs, fabricating steel belt conveyors, and warehousing all Sandvik products.

◆

Construction of the 990 ft long main mill building for **Kaiser Aluminum & Chemical Corporation** near Ravenswood, W. Va., is scheduled to start this month. The multi-million dollar aluminum sheet and foil rolling mill should be in production by mid-1956.

◆

John Fick, Vice President in charge of the Steel Division of **The Timken Roller Bearing Company,** has announced a $360,000 steel mill expansion program. To meet the increased demand for heavy walled long length tubing, the Gambrinus piercing mill will be lengthened to pierce tubing from 50 to 130 per cent longer than lengths presently processed there.

◆

A new **Plymouth** engine plant with capacity for building V-8 engines for Plymouth cars at three times the current volume will be in operation at Chrysler's Mount Road Plant in Detroit by late this year.

◆

Initial production of titanium sponge in production facilities of the Chattanooga, Tenn., **Cramet, Inc.** plant was started in January. Two units of the control plant at Chattanooga are, in part, scaled down production facilities and, in part, full scale units. In operation they have already proved their function of further testing and proving process design. Cramet, Inc., is a subsidiary of Crane Co., Chicago.

◆

An automotive parts manufacturing plant is scheduled for construction near Sandusky, Ohio, by the **Ford Motor Company.** The facility will be a component of the company's Parts and Equipment Manufacturing Division which now operates seven plants in Michigan and another in New York State.

Chrysler Corporation is planning construction of an 800,000 sq ft plant for the manufacture of automatic transmissions on the outskirts of Kokomo, Ind. The new plant will virtually double the company's present capacity for producing automatic transmissions.

◆

Furane Plastics, Inc., announced further expansion in its production of epoxy tooling resin, "Epocast," through the erection of an additional building to be devoted to production of resin formulations.

Olympic Metal Products Co., Inc., of Alpha, N. J., has completed a 100 percent expansion in plant facilities, to be used almost exclusively for the production of deep drawn metal housings.

◆

The American Brass Company will soon begin construction of a new brass mill in the Paramount district of Los Angeles. The new mill will be for the production of copper and copper-base alloys in the form of sheet, strip, rod, tubing, and drawn copper products. Annual capacity is estimated to be approximately 30,000,000 lbs.

The NEW CLAMPCUT SINE VISE

QUALITY CONTROL CHECK AT FACTORY. READING OF "ONE-TENTH" INDICATOR READS 0 ALONG 6" OF THE PARALLEL. NOTE ADJUSTABLE STOP (See Inset).

SQUARE WITHIN 0.0001"

THE POSITIVE WAY TO HOLD WORK FOR PRECISION GRINDING

Hardened, Ground and Lapped — Deep Frozen for Stabilization — Holds Tapered Diameters and Odd-shaped Workpieces

For inspection, grinding, milling, drilling and tapping, jig boring, layout work . . .

This new J & S Clampcut Vise is one of the most practical precision vises ever developed. Its many helpful features explain why:

It is square, for example, with 0.0001" or less in 1" in 4 positions. It is attachable to J & S 5" sine bar with 0.100" recess for small angles.

Accurate, Adjustable Stop

Like all J & S workholding tools, it has a unique downholding clamping action. This assures dependable, accurate positioning of workpieces. An adjustable stop provides fast, sure positions for repeat operations. Workpieces can be loaded and unloaded rapidly.

Holds Tapered, Odd-shaped Workpieces

The clamping jaw of this J & S Precision Grinding Vise swivels to permit holding of tapered and odd-shaped workpieces. It holds round stock from ⅛" to 2½" in diameter in Vee-block fashion. The range of jaw openings is from 0" to 3".

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CIRCLE INFORM-A-GRAM KEY NO. 1851

. . . Precision Parts, from page 183

gives superior results when the parts are to be preserved in strippable plastic. Records show that where vapor degreasing, combined with finger print removal and proper drying is a part of the standard procedure, failures due to corrosion are virtually non-existent.

Another factor which is of prime importance is the melt tank equipment. Peelable plastic is a poor conductor of heat. It begins to decompose at temperatures above 400°F. Melt tanks used must be designed to eliminate any possible hot spots. Only equipment so designed and constructed that the entire surface of the inner tank acts as a heating surface should be considered.

The melt tank should be no larger than required to accept the largest part which is contemplated for dipping. Tanks are available in a wide range of sizes including portable, gallon units as shown in the illustrations. Because of the heat-sensitive nature of the peelable plastic coating, any given quantity of the plastic should remain at operating temperatures for as short a time as possible. A large tank used in such a manner that only a small amount of plastic is withdrawn at each dip will result in the bulk of the plastic being held at operating temperatures (300°-350°F) for unduly long periods, causing premature breakdown.

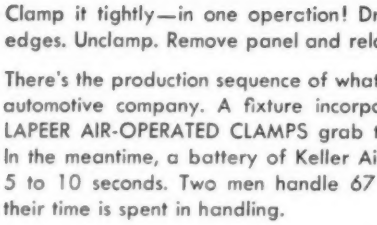
A properly designed tank of a size in keeping with dipping requirements, kept at operating temperatures only during periods of actual use, will maintain the initial quality of the plastic for hundreds of hours.

In large tanks the molten plastic must be continuously circulated to prevent the plastic in contact with the walls from overheating. Means for introducing slabs of fresh plastic must be provided to allow for the replacing of the plastic withdrawn as parts are preserved. Air bubbles should be kept out of the dipping area. Excellent large-size dipping tanks (specifically designed for these plastic coatings) are available commercially.

The coating operation with these materials is simple. They are applied by means of one quick dip in and out of the molten plastic. This compares favorably to the older methods of grease, oil, and dunnage and wrapping paper protectives.

Inasmuch as the time and labor involved in these older methods run up the cost of parts protection, there has long been needed a method which is not only simple in itself, but also rapid in achievement. Simultaneously with the improvement of machining techniques that have

67 JOBS AN HOUR



MODEL AO-400

Lift a sedan roof panel onto a fixture. Clamp it tightly—in one operation! Drill 47 holes simultaneously into the roof edges. Unclamp. Remove panel and reload.

There's the production sequence of what could easily become a bottleneck at one automotive company. A fixture incorporating two unusual tools does the job. LAPEER AIR-OPERATED CLAMPS grab the panel rigidly, release upon demand. In the meantime, a battery of Keller Airfeedrills does the actual drilling in from 5 to 10 seconds. Two men handle 67 panels each hour even though most of their time is spent in handling.

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CIRCLE INFORM-A-GRAM KEY NO. 1861

given finer surfaces and tolerances to metal parts and products, the need for more and reliable protection from a wider and wider range of surface injuries has become more acute.

On the other hand, in reverse, there has long been a need for rapid and low cost **removal** of whatever coating may be in use. Removal of wrapping, oils, greases, papers, and so on is usually time consuming and may involve the use of special removal equipment and methods. With the newer plastic strippable coatings, removal before the use of the part or product is rapid and inexpensive in time and labor.

As a matter of fact, when the part is needed for use, the coating surface or "envelope" is merely slit and then stripped rapidly off (like peeling a banana!) thus leaving the part ready for use, as clean and uninjured in surface as it was when it came from the machine. In other words, there is no need to remove oil or grease by means of solvents or to unwrap protective papers.

The type of coating in wide usage today is fully transparent, one of the features of special interest. Through this protective film, the detailed surface of each coated part may be inspected without its removal. This is often desirable or even necessary for inspections, in handling of stock (serial number readings), and for quick identification of the item. This transparency, too, is said to be a factor in the lower cost utility of the plastic type coatings.

After being used, this type of coating can be remelted and reused, which is a great advantage in connection with inter-plant protection of tools, gages, etc.

Laboratory work plus tests under usage conditions have been improving these strippable plastic coatings since 1944. New resins have been introduced in their manufacture, also new plasticizers, and effort has been successfully made to reduce more and more the cost of their use. The fact is that the amber-colored coatings which were the genesis of this method bear small resemblance to the clear and tough protective coatings of today.

Said D. R. Welter, of the Bischoff Chemical Company, an authority who has engaged in prolonged research in this field:

"The hot melt protective strippable coatings available today bear little resemblance to the first such coatings developed during the last war. Today there are custom-tailored coatings designed for specific applications.

"For example: very low cost coatings exist for inter-plant use on tools, parts and sub-assemblies. Also are those used for shipping or storage packaging where cost and protection are the primary concern. Then there are water-white coatings that not only give the desired protection but their crystal clarity adds great sales appeal. There are specification coatings for Army, Navy, Air Force use. In addition are other hot melt compounds made to fit specific needs.

"The variety of compounds offered, the development of better melt tanks and increased stability in the compounds themselves have resulted in much better bath life and fool proof operation. The simplicity of application and economical nature of these coatings are contributing to their fast increasing use on all types of precision metal parts."

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air turbine tools and motors
for faster, smoother grinding and power

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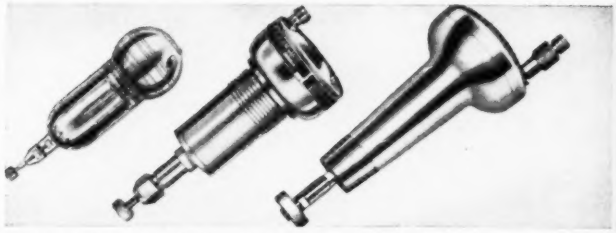
PORTABLE GRINDERS
light weight . . .
always run cool



B-1B, 1/6 HP, 75,000 RPM . . . weighs only 12 ounces, a precision, quality tool.

D-1A, 1/4 HP, 50,000 RPM . . . a medium duty unit with dependable power and speed.

E-1A, 1/2 HP, 38,000 RPM . . . heavy duty, proper speed to get grinding jobs done.

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¼ HP, 50,000 RPM air turbine motor gives speed for precision grinding. Offset head positions wheel in any axis from center to 1" from center.

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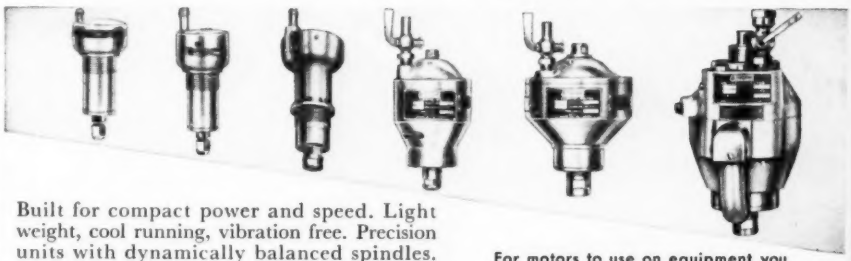
Onsrud air turbine motors



Built for compact power and speed. Light weight, cool running, vibration free. Precision units with dynamically balanced spindles. Speeds from 22,000 to 50,000 RPM... ¼ to 2 HP.

For motors to use on equipment you build, write for Onsrud Air Turbine Motor Bulletin 1138.

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Portable Tool Representatives Wanted . . . Good Territories Available

CIRCLE INFORM-A-GRAM KEY NO. 1871

A Simple Technique For Brazing Porous Sintered Metals

By using sintered metal parts and joining them with low-temperature silver brazing alloys, a number of metal fabricators are realizing substantial savings in material and labor costs over their former method of machining these parts from solid metal.

However, because of its occasionally high porosity, sintered metal may be tricky to braze. When the sinters are made dense, they can be brazed normally. But when the parts are porous — typically in bearing applications —the porosity may interfere with the making of a good joint. Porous compacts tend to absorb the brazing alloy, much like a sponge soaks up water, leaving little or no alloy for the joint.

The technical laboratory of Handy & Harman, manufacturer of brazing alloys and fluxes, reports a convenient and practical solution for overcoming porosity problems when brazing sintered parts. The method consists of filling the pores just below the surface of the metal with colloidal graphite. The graphite forms a non-wettable, non-absorbent coating which prevents the alloy from soaking into the interior of the piece. Graphite emulsions, in either oil or water base, are available commercially for this purpose. In some cases the oil-base may be preferred because it usually penetrates into the metal more readily.

When high porosity makes sintered metals difficult to braze because of the absorption of the brazing alloy, a coating of colloidal graphite applied to the joint faces before brazing will prevent absorption and permit the brazing to be completed normally.

Here is the step-by-step procedure recommended by Handy & Harman for preparing porous compacts for brazing:

1. Apply the colloidal graphite, by hand brush or dipping, to the surfaces to be brazed.
2. Let the solvent evaporate. The water emulsion will usually dry satisfactorily in air; the oil emulsion may require a short drying period in an oven.
3. After the piece is dry, remove the graphite coating from the surface of the metal using emery cloth or a brushing wheel with light contact pressure.
4. Degrease with carbon tetrachloride or other solvent, taking care not to handle the joint surface or touch it with oily materials thereafter.
5. When the piece is dry, flux and braze in the usual manner.

A number of firms have solved a difficult brazing problem with this process. Some of the high-production shops use the batch system for applying the graphite coating, drying and degreasing. By working with groups of parts, rather than individual parts, the handling time is reduced to about a minute per piece.

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POWER PRESSES
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Use the right type of press for your work.

We show a few of the many styles of presses available. We offer you presses with specifications to meet your particular requirements at standard prices. Presses equipped with the latest developments in air operated clutches for maximum production and speeds. Single and double feed rolls and dial feed attachments for safe, automatic fast production.

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Perkins Power Presses SINCE 1885

PRESSES BUILT TO SPECIAL SPECIFICATIONS

CIRCLE INFORM-A-GRAM KEY NO. 1881

J. Joseph Kelly has been appointed Sales Manager of Reed-Prentice Corporation, manufacturers of machine tools, plastic injection molding machines, and casting machines. Mr. Kelly joined Reed-Prentice after serving as Field Sales Manager of Package Machinery Company.

◆

Ralph Williams has been appointed Sales Engineer of Ipsen Industries, Inc., Rockford, Ill., for the Cleveland district.

◆

The Marshall Steel Company has announced the appointment of **Gilbert R. Jarman** as General Sales Manager of all products. For the past 10 years Mr. Jarman has been with the Columbia Tool Steel Company. He completed a full apprenticeship as tool and die maker before entering sales work.

◆

Robert M. Pennington is now a Representative for Northern Ohio for the Pace Corporation, producer of precision machined parts, stampings, and assemblies.

◆

Robert E. Thomas succeeds **James J. English** as General Sales Manager of The Triplex Screw Company, Division of the Murray Corporation of America. Mr. Thomas was the Assistant General Sales Manager of the Cleveland Cap Screw Company.

◆

W. J. Lohmeyer, Jr. has been promoted to District Manager of Latrobe Steel's Pittsburgh territory. Mr. Lohmeyer has been with Latrobe for 10 years.

◆

John D. Joyce is now Industrial Sales Manager of Blue M Electric Company's Industrial Division. Formerly with Claud S. Gordon Co., he has specialized in engineering, development, and sales of ovens, furnaces, and instrumentation for the industrial and research fields.

◆

Two appointments have been made recently by Barber-Colman Company. **Howard A. Nelson** is now Sales Manager of the Small Tool Division and **Charles A. Torson** is Sales Manager of the new Hendey Machine Division. Mr. Nelson was formerly Assistant Sales Manager of the Machine and Small Tool Divisions and Mr. Torson was Sales manager of the Hendey Machine Co., Inc.

Firth Sterling Inc. has appointed **John S. Roller** as Detroit District Sales Manager. Mr. Roller was formerly Assistant to Thomas G. Barnes, Vice President in Charge of Sales. Before joining Firth Sterling in 1951 he was Vice President and General Manager of The Method X Company, a Firth Sterling affiliate.

◆

The Aro Equipment Corporation of Bryan, Ohio, manufacturer of air tools, announces the appointment of **Don L. Anderson** as Assistant Division Manager in the Milwaukee area.

New Sales Manager of **Federal** Carbide & Cutter Company, Inc., of Rochelle Park, N. J., is **Fred L. Amter.** Mr. Amter was formerly a tool sales engineer at Federal.

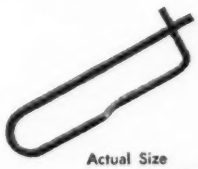
◆

W. W. Greenway, Vice President of U. S. Industries, Inc., and General Manager of Axelson Manufacturing Company, has named **Joe A. Jean** as Special Factory Sales Representative for the new Axelson Milling Machine (formerly Fray). Mr. Jean, for the past year and a half, was Sales Manager for the Fray Milling Machine Company.

I've been making tools for wire and ribbon metal forms long enough to know that A. H. Nilson Fourslides are the most adaptable and produce parts most economically. For easy set-up and tool adjustment, accurate feed, and rugged design . . . Nilson Fourslides are my choice.

Look at the part shown on the left . . . made in our Nilson #S-O Fourslide. Better than 5,000 of these are produced per hour *automatically* from coiled stock using .039 dia. tin-plated copper wire, and this tops any previous production method.

I'd suggest you contact Nilson yourself and learn how you can increase production and lower costs with Nilson automatic Fourslides.



Actual Size

A.H. NILSON MACHINE COMPANY

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Automatic Chain Making Machines : Staple Forming Machines : Wire and Stock Reels : Wire Straightening Equipment : Slide Feeds for Presses

CIRCLE INFORM-A-GRAM KEY NO. 1891

MANUFACTURING MEMOS

Happy Anniversary! —

• In 1855, at the R. T. Crane Brass & Bell Foundry, as the Crane Company was originally called, young Richard Crane first produced brass couplings and copper tips for lightning rods. Now, one hundred years later, the Crane Company celebrates its Centennial as the world's largest manufacturer of valves and fittings and producer of kitchen, bathroom, and heating equipment.

• Ten years after its founding in 1925, the Snyder Tool & Engineering Company introduced its first automation machine—a transfer type machine for grinding cast iron brake shoes. Just recently, in its thirtieth year of business, the Detroit pioneer builder of automated machines delivered an eight-station machine that produces 230 automatic cast iron steering gear housings an hour at 80 percent efficiency.

Production Notes —

• A two million dollar contract from the Department of the Navy for compass-controlled directional gyro compass systems for use in naval fighters, attack planes, and submarine-hunting helicopters has been awarded to General Electric's Instrument Department in Lynn, Mass.

• Quantity production of two new titanium alloys is reported at Mallory-Sharon Titanium Corporation, Niles, Ohio. The 6 Aluminum-4 Vanadium Alloy is the first weldable titanium alloy having notch toughness and properties comparable to those of high strength steels used in armour plate and weapons. The 3 Manganese Complex Alloy, made by the company's "Method S" process (double melting using a consumable electrode), is the first heat-treatable titanium alloy available in production quantities whose properties can be varied predictably by heat treatment.

Helpful Movies on . . .

• Plant Modernization—"A Way of Thinking," 16 mm, color, 15 min., available from Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio.

• Band Sawing—"Production Tooling" 16 mm, color, 10 min., from The DoAll Company, Des Plaines, Ill.

• Radial Drill Former—"Precision Metal Forming," 16 mm, color, 31 min., from The Cyril Bath Co., 32380 Aurora Rd, Solon, Ohio.

Michigan Tool Company, with three plants in Michigan and a subsidiary, Colonial Tool Company, in Windsor, Canada, has been acquired by Ex-Cell-O Corporation, Detroit. Michigan Tool's gear-cutting, finishing and gaging equipment, and speed reducers and transmissions complement Ex-Cell-O's machine and tool items.

◆

All assets of the Industrial Tools Manufacturing Company have been purchased by the Plomb Tool Company, Los Angeles. The newly acquired plant — known as Industrial Tools Manufacturing Corp. — is the company's sixth.

◆

The Board of Directors of Firth Sterling, Inc., Pittsburgh, have authorized the issuance of sufficient capital shares of Firth Sterling stock to acquire the assets of the Houston Carbide Corporation of Houston, Texas.

◆

The Marion, Ohio, plant of Motor Products Corporation has been purchased by Whirlpool Corporation, world's largest manufacturer of home laundry appliances, for the manufacture of automatic gas and electric clothes dryers. Pilot production should begin in the Fall.

◆

Mackintosh-Hemphill Company, Pittsburgh foundry and engineering firm, will continue in operation as a division of E. W. Bliss Company after the Bliss proposal is approved by Mack-Hemp stockholders.

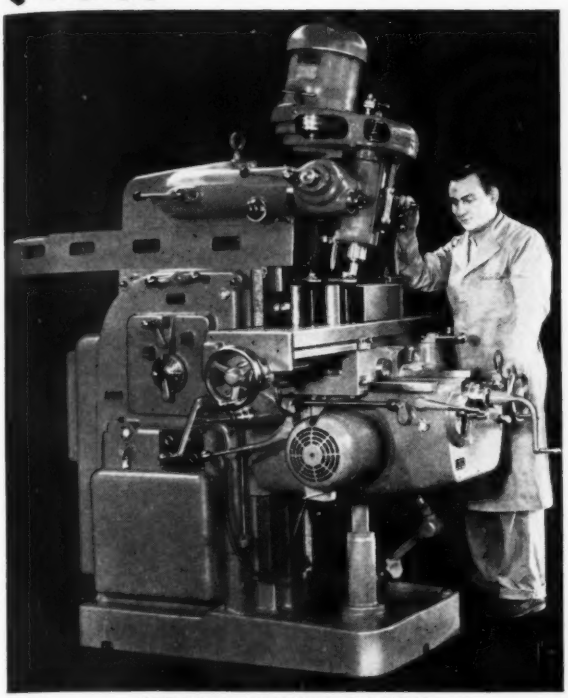
◆

The name of Honan-Crane Corporation, Lebanon, Ind., has been changed to Houdaille-Hershey of Indiana, Inc., comes the word from the parent company, Houdaille-Hershey Corporation, Detroit, Honan-Crane, a subsidiary of the Detroit firm for the past 10 years, is one of the pioneers in the oil and coolant filtration fields.

◆

A newly developed line of dial indicators and other measuring instruments is being manufactured by newly incorporated Petz-Emery Inc. in Pleasantville, N. Y. President John L. Petz has over 45 years experience in instrumentation, tool engineering, and manufacturing and Vice President Alfred H. Emery has spent over 30 years in the precision measuring and gaging field and has contributed several inventions which have been accepted by industry.

New GORTON DOUBLE-DUTY MILL PROVIDES SPECIFIC ADVANTAGES



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•

COMBINES RUGGED DESIGN, TOP PERFORMANCE WITH TOOL ROOM ACCURACY

•

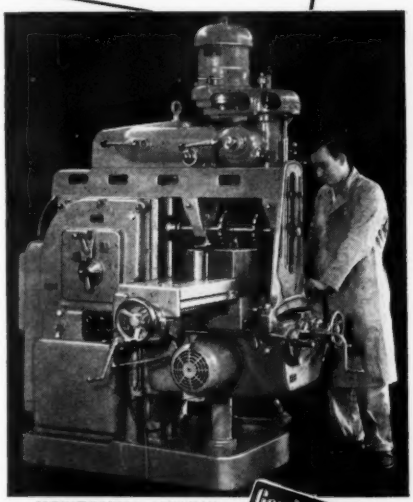
For horizontal milling and vertical or angular milling without re-locating work

As a horizontal it does conventional and climb milling up to 2,000 R.P.M. As a vertical-universal, it does precision work up to 5,600 R.P.M.

COMPARE THESE FEATURES

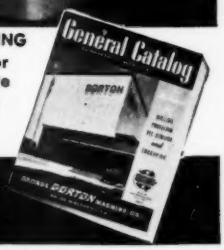
Exclusive Gorton Receptor Ram increases work area, vertical capacity and transverse cutting capacity.

Available with 56″ table (28″ travel), 62″ table (34″ travel) or 76″ table (48″ travel).	Rigid support for work with 24½″ bearing spread on knee and large square lock bearing guides.
Horizontal spindle horsepower: 7½, 10 or 10 over 5. Super-speed belt-driven vertical spindle: 1½ over ¾ H. P.	Aircraft type lubrication system dissipates spindle heat, minimizing growth at nose.
Dial-type load meter indicates cutter condition and machine operating efficiency.	Interchangeable Assembly Unit Construction offers multiple advantages.
Exclusive removable coolant pan speeds sump cleanout and coolant interchange.	Mechanical and dual electrical overload protection for cutters and work.



HORIZONTAL MILLING

Write for Complete Catalog 1655-1204



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GEORGE GORTON MACHINE CO.

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SINCE 1893

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A 8217-1P

CIRCLE INFORM-A-GRAM KEY NO. 1911

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SAVE 40 WAYS

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12. Finishing Rubber Molds
13. Finishing Plastic Molds
14. Finishing Permanent Molds
15. Finishing Extrusion Dies
16. Cleaning Before Inspection
17. Scale Removal
18. Removal of Feather Edges
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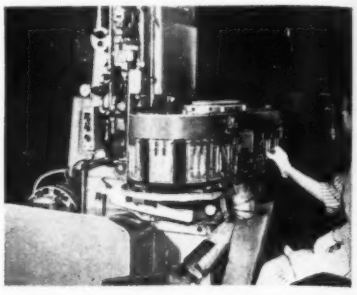
AMERICAN WHEELABRATOR & EQUIPMENT CORP.
852 S. Byrkit Street, Mishawaka, Indiana
CIRCLE INFORM-A-GRAM KEY NO. 1921

HIGH PRODUCTION, CLOSE TOLERANCE BELT GRINDER

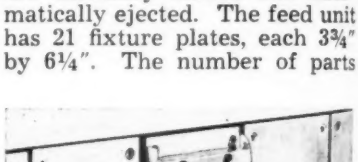
The "BG-8 Automat" abrasive belt grinder is equipped with a self-powered, continuous work feed and an 8″ by 107″ abrasive



belt, for flat grinding and polishing small metal parts.

Two typical applications of the new machine are grinding 2,100 knife handles an hour (illustrated) and finishing the sides of plier handles at the rate of 1,440 parts per hr. Tolerances of plus or minus 0.005″ to plus or minus 0.001″ were maintained for these jobs.

Workpieces for the new unit are manually loaded but automatically ejected. The feed unit has 21 fixture plates, each 3¾″ by 6¼″. The number of parts



that can be loaded on each fixture plate is limited only by part size. The close-up photo shows a fixture plate holding ten nylon windshield wiper valves.

Moved by parallel roller chains, each fixture plate is tracked to the leading edge of the abrasive belt, riding on hardened and ground shoes over hardened and ground steel rails. As the work advances to the belt surface, it is fed slowly across the belt, then is retracted quickly before reaching the far edge of the belt.

Contact The Engelberg Huller Co., Inc., Syracuse, N. Y., for further information, or — **Circle Inform-A-Gram Key No. D2.**

INGENIOUS TOOLING

Profile milling the edges of 155″ long steel closure ribs for large aircraft is now being performed efficiently and economically on a spindle shaped (Oliver)

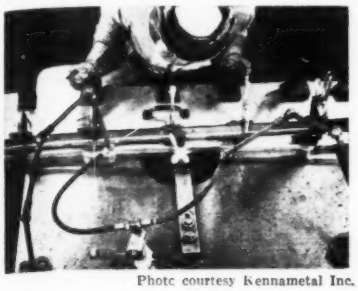


Photo courtesy Kennametal Inc.

at 2062 sfm using a carbide-tipped, 1¾″ diameter three-flute special end-mill.

Clever adaptation of this woodworking machine permits accurate machining of the modified SAE 4340 (heat-treated to 40-42 Rockwell C) slender workpieces to a definite profile.

These closure ribs for B52 aircraft, which are 3/32″ to ½″ thick, are clamped to an aluminum fixture, the edge of which has been accurately machined to the required rib contour. This edge acts as a template and rides along an Ampco bushing mounted on the cutter shank — thus permitting the desired profile to be generated on the workpiece.

Floor-To-Floor Time Cut 96% — Two machines in line, with a roller conveyor between them, are used for this operation. The clamped workpiece is hand-fed into the first or roughing machine which takes a 3/32″ to ½″ depth of cut at 4,500 rpm. On this machine the shank mounted bushing is about ⅛″ larger in diameter than the Kennametal K2S cutter. This leaves about 1/16″ stock for finishing. The workpiece is then slid across to the finishing machine on which the Ampco bushing is the same diameter as the K2S cutter. It requires only two minutes to complete each cut. Floor-to-floor time for rough and finish machining an edge is approximately 20 minutes. An estimate of floor-to-floor time for doing the same operations on a standard profiling machine is about 10 hrs.

During the cutting cycle two coolant streams of CO_2 are directed at the cut. Life per grind of the 1¾″ dia. end mill is 2 cuts on roughing — and 5 to 8 cuts on finishing.

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BARNES "ROCKET"

THE HACK SAW BLADE THAT HAS— Everything!

SURE — SAFE PRODUCTION CUTTING AT LESS COST PER CUT!

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ROCKET HAND HACK SAW BLADES
Exclusive FEATURES ➡
FOR GENERAL PURPOSE CUTTING

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Users report consistent, outstanding performance for Barnes Rocket blades.

Barnes gradient hardening process and manufacturing skill assures flexibility and toughness. Rocket blades do not shatter. The fully hard cutting edge combined with flexibility makes the Rocket ideal for all general purpose cutting. **Try Barnes Rocket blades today** for **utmost** satisfaction.

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HAND BLADE

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FAMOUS FOR QUALITY 1297 TERMINAL AVE. • DETROIT 14, MICH. ESTABLISHED 1919

CIRCLE INFORM-A-GRAM KEY NO. 1931

MEN YOU SHOULD KNOW

Former Chief Service Engineer **Harold Ashton** has been appointed Manager of Sales and Service of the National Broach & Machine Co. in Detroit.

◆

The appointment of **William L. Shank** as Works Manager of the Kearney & Trecker Special Machinery Division has been announced by the company. For the past five years Mr. Shank has been Vice President in charge of manufacturing at Ingersoll Milling Machine Co.

Joy Manufacturing Company, Pittsburgh, has announced the election of **Louis G. Helmick, Jr.,** as Vice President of Manufacturing. Mr. Helmick joined the Joy organization in 1947 and became Manager of Manufacturing last year.

◆

N. Douglas MacLeod, Jr., has been named executive Vice President of Abrasive Machine Tool Co. in East Providence, R. I. In this position he will supervise all company operations.

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CHICAGO U. S. A.

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• • • to Turn out PROFITS

Sheldon Lathes are designed and built to do accurate lathe work rapidly and profitably. Moderate in price they have the collet, swing and power capacity to do most toolroom work.

UM56P
13" Swing Lathe
34" Between Centers
Rapid Shifting "U" Drive

Design Features:

- Large and wide "Zero Precision" Tapered Roller Spindle Bearings—permit operation at all speeds, retain accuracy, end expensive bearing maintenance costs.
- 54-pitch Gear Box—gives both standard and many hard to get thread ratios.
- Large Micrometer Dials—Make accurate operation easier.
- Extra Collet Capacity—1⅛" hole through spindles available on 10", 11" and 13" swing lathes.
- More Power to Spindle—Efficient drives with bigger motors and double neoprene cog V-belts to spindle.

OPTIONAL FEATURES AT EXTRA COST include: Hardened ways, Long Tapered Key Drive Spindles, 4" D1 Camlock Spindles bed turrets, collet attachments, and other production and toolroom accessories. Lathes available with a choice of "Bench," "Cabinet" or "Pedestal" mountings.

Write for New Catalog G-55

SHELDON MACHINE CO., Inc.
4235 N. Knox Ave. • Chicago 41, Illinois

CIRCLE INFORM-A-GRAM KEY NO. 1941

The appointments of **William A. Damerel** as a Vice President and **Dr. Fred Schulman** as Assistant Director of Research have been made by the Mercast Corporation. Mr. Damerel will be responsible for marketing and technical sales activities and Dr. Schulman will aid in the expansion of the company's research activities.

◆

New General Manager of Pittsburgh Gear Company, a subsidiary of Brad Foote Gear Works, Inc., is **William H. Foster.** Mr. Foster has been associated with the gear industry for many years. Most recently he was Manager of the Gear Jobbing Division of W. A. Jones Foundry & Machine Company and prior to that he was Manager of the Gear Division of Philadelphia Gear Company.

◆

Thomas J. Clark, formerly Vice President of Freeland Gage Co., and President of Norwest Gauge Co., both of Detroit, has organized the Clark Gauge & Tool Co. **L. Parker Rollins,** an associate of Mr. Clark at Freeland and Norwest, is Shop Manager of the newly formed company.

◆

Robert T. Keller, Vice President of Chrysler Corporation, has been placed in charge of West Coast automotive plant operations, according to L. L. Colbert, Chrysler President. Mr. Keller will headquarter at the recently-expanded Chrysler Los Angeles plant.

◆

Herbert M. Shilson has been elected to the Board of Directors of The Cross Company to replace the late **Milton O. Cross, Sr.** At the same time, **Kurt O. Tech,** Chief Engineer, was added to the Board and **Milton O. Cross, Jr., Ralph E. Cross,** and **Clark Bennett** were re-elected as company officers.

◆

John M. Maitland has been appointed General Manager of the Detroit District Office of The Bristol Company. Mr. Maitland joined Bristol in 1944 as a member of the sales staff.

◆

Arthur J. Redmond has been named a Vice President of Allied Products Corporation and now assumes full responsibility for co-ordinating all sales activities of the Richard Brothers Division's hard die services, "Allite" (zinc alloy) and plastic dies, as well as experimental, prototype, and large short-run stampings. Vice President **Walter S. Jakubowski** will continue as General Manager of all Richard Brothers die shop and stamping operations.

MEN YOU SHOULD KNOW

Promotion of **M. C. Patterson** and **R. S. Bright** as Vice Presidents of the Dodge Division, Chrysler Corporation, has been announced by W. C. Newberg, Dodge President. Mr. Patterson is now in charge of the division's manufacturing. Mr. Bright has overall direction of the Nine Mile Press plant and the Dodge plants at Indianapolis, New Castle, and Kokomo, Ind.

◆

Ipsen Industries, Inc., of Rockford, has appointed **George K. Lane** as General Manager of Ipsenlab. In this position Mr. Lane will coordinate the analytical and experimental facilities of Ipsenlab for all industrial concerns interested in improved heat treating methods and techniques. He will continue to represent Ipsen Industries as a Sales Engineer for the Rockford territory.

◆

C. Thorpe Thompson is now Executive Vice President and General Sales Manager of Cleveland Instrument Co., Cleveland, Ohio. He heads the company's activities in the field of automatic gaging, sorting, and control devices and will integrate their national distribution of electronic gaging equipment.

◆

Partners in the new Grawell Carbide Tool Co. in Detroit are **Raymond C. Heartwell** and **Lawrence J. Hartwell,** well known in Michigan as carbide tool specialists, and **Anne E. Graham,** former office manager and assistant Secretary of Raymac Manufacturing Co. Raymond Hartwell was formerly in charge of production at Raymac.

◆

Three Executive personnel changes in the Shakeproof Division of the Illinois Tool Works have been announced by E. W. Fuller, Vice President. **A. L. Pontius** is now General Manager of the Stamped Products Division in Des Plaines, **William E. Bruse** is General Manager of the Threaded Products Division in Elgin, and **Kenneth C. Mackay** is Assistant General Manager of the Threaded Products Division.

◆

Announcement of the appointment of two Detroit Cross Company executives to key policy making committees of the National Metal Trades Association has been made by Earle S. Day, NMTA President. **Carl Chellquist** will serve on the Shop Training subcommittee and help to formulate association activities in the field of training industrial shop personnel. **William Gallant** will be active as an alternate member of the Personnel Administration and Testing Committee.

Ben Carroll has been appointed Research Director of Furane Plastics, Inc., Los Angeles, in the company's expanding program of research and development with epoxy resins for tooling, structural, and dielectric applications.

◆

Three have been named to new posts at Allis Chalmers Manufacturing Company's Pittsburgh Works. **Milan P. Getting, Jr.,** since 1947 Assistant to the Works Manager, has been appointed Assistant to General Manager D. A. Griffith. Mr. Getting's successor is **George Shombert, Jr.,** Assistant Superintendent of the electrical test department since 1949. **Sebastian W. Phillippi** succeeds Mr. Shombert.

◆

Francis T. Greenup was recently appointed Chief Engineer of Consolidated Engineering Corporation in Pasadena, Calif. Mr. Greenup will direct activities of a section responsible for new product design, engineering drafting, and operation of the Model Shop.

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1. IMMEDIATE DELIVERY
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Because Porter's ONLY business is producing Punches and Die Buttons—You always get QUALITY products at substantial savings.
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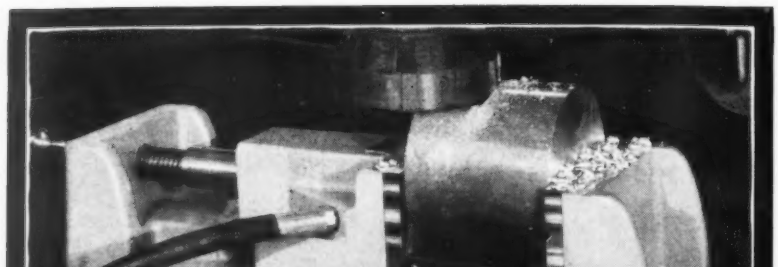
CIRCLE INFORM-A-GRAM KEY NO. 1951



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The MilOmatic "MM" Power Vise cuts loading time 80% and has a locking force of 9000 lbs. at normal air line pressure. This fast, strong, air powered hydraulic clamping means more production, less labor per piece on milling, drilling, grinding, shaping, broaching, and other machine applications. "MM" eliminates expensive tooling when specially shaped jaws are installed.

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CIRCLE INFORM-A-GRAM KEY NO. 1961

DEKA BORE

repeats to

.0001"

in 30 seconds

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

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CIRCLE INFORM-A-GRAM KEY NO. 1962

AUTOMATED PISTON GRINDER

The increasing requirements of automation in the high production grinding of automotive pistons has been met by the Landis Tool Company in the development of a new precision grinder which automatically loads, grinds, and discharges the pistons.

Fig. 1. 5" x 8" Type H automatic piston grinder with automatic work loader and ejector. Machine cam grinds the piston skirt. Stock removal is .015" and production is estimated at 115 pistons per hour.

The aluminum pistons can be delivered to the machine by conveyor and transfer mechanism. An automatic timed loader places the piston in grinding position. Rotation of the piston begins as the grinding wheel advances rapidly to its grinding position. Slow grinding feed then proceeds to a positive, predetermined size. After a timed spark-out period, the grinding wheel retracts rapidly to a back position and the piston is ejected to another conveyor. At the same time another piston is loaded and the cycle repeats itself.

The aluminum pistons are ground by the infeed method,

Fig. 2. Top view, close up of piston loader and grinding wheel in contact with a piston.

using a wide wheel which reciprocates laterally during the grinding cycle. Pistons are elliptical in shape. This shape is produced by using a master cam and rocking work-cradle.

Wheel dressing is automatic after a predetermined number of pistons are ground. The wheel head automatically advances the same amount as the size of the wheel is decreased by dressing. This eliminates compensation by hand to return the wheel head to the correct position for proper size.

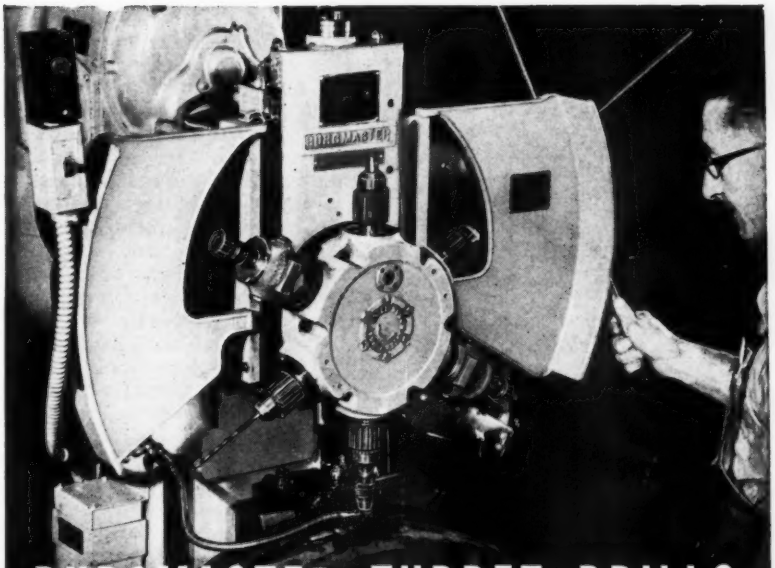
The 5" Type H piston grinder has Microsphere bearings for both the work head spindle and the grinding wheel spindle. These bearings are of one piece steel construction with babbitt lining and faces. The spherical shape permits perfect alignment to the spindle and adjustable running clearance. Lubrication to the Microsphere bearings is automatic. Pressure must be built up in the system before the motors can be started. In case of pressure failure, the motors for the grinding wheel and work spindle will stop rotation.

NEW BRAZING FLUX WITHSTANDS HIGH TEMPERATURES

A special flux for silver alloy brazing of stainless, chromium heat resisting alloys, and chromium and tungsten carbides reduces oxides of the refractory metals while protecting the underlying metal from further oxidation during brazing. Special Handy Flux Type B-1, a product of Handy & Harman, New York, withstands heating at 1400-1600° F. for short times and increases its life at lower brazing temps.

The key to the unusual performance of the flux is that it contains a strong deoxidizer and one whose oxide is a flux former. In a sense, the flux regenerates itself during the heating cycle, thus providing the longer activity span required for elevated temperatures. The flux can be removed readily with hot water.

Among important applications of the flux are its use with AMS 4772 brazing alloy, flow point 1515° F., for brazing jet engine compressor blades, and for the attachment of chromium carbide and tungsten carbide tool tips.



BURGMASTER TURRET DRILLS

with POWER INDEXING

Reduce tool changing and set-up time, maintain high quality . . .

This versatile BURGMASTER is modified by removing table and substituting index fixture, pointing up the lability to handle large or small work pieces.

REPORT FROM:
SOLAR AIRCRAFT COMPANY
San Diego, Calif.

The BURGMASTER Turret Drills at Solar Aircraft Company's San Diego plant provide versatility with a minimum of tool changing and set-up time. Used in the production of high alloy "hot" parts for jet aircraft engines, the six spindle units have effected valuable savings in time and money without sacrificing the high quality so vital in components for the powerful jet engines in use today.

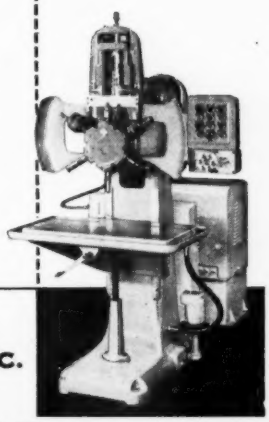
Pre-setting features permit correlation of related operations, thus reducing scrap and minimizing the error factor. Pre-selective speed control on each individual spindle gives all required r.p.m. for various size drills.

The BURGMASTER Turret Drill holds to close tolerances so common in the aircraft industry. On one countersink, drill and tap operation on a jet engine part, tolerances run .0002 for hole location and .003 for squareness.

BURGMASTERS cut costs on drilling, tapping, threading, counterboring, countersinking, grooving, spot facing, form tooling, hollow milling, etc.

AVAILABLE IN:
- **Six spindle manual**
- **Six spindle, hydraulic, automatic**
- **Eight spindle, hydraulic, automatic**

Automatic hydraulic BURGMASTERS feature skip indexing, automatic cycling and infinitely variable pre-selective feeds. All BURGMASTER machines feature power indexing, pre-selective spindle speeds, very close pre-selective depth control.



Write for Bulletin No. TP-4

BURG TOOL
MANUFACTURING COMPANY INC.
P.O. BOX 48, GARDENA STA., GARDENA, CALIF.

CIRCLE INFORM-A-GRAM KEY NO. 1971

SAVE TIME
JIG BUILDING
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MASTER
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No. 1004
24" to 64"
height range

Instrument craftsmen designed this stand to permit faster and more accurate set-ups of minimum height Jigs and Fixtures, Machinery Alignment, and Tooling and Production. Provides users of transits, levels and jig collimators with the most accurate, stable, flexible and safe stand ever designed for industry.

HUNDREDS NOW IN USE BECAUSE OF THESE EXCLUSIVE FEATURES:

Vertical micro-feed adjustment
Lateral adjustment through 360°
Easy portability
Weighted base with low c.g.
Precision rigidity
Competitively priced

FOR FULL 51" TO 82" HEIGHT RANGE SELECT THE SERVCO NO. 1001 MASTER STAND
Identical in construction and working parts to the Master Stand No. 1004, provides for maximum instrument heights.

write for YOUR COPY OF

SERVCO SURVEYORS SERVICE CO.
PRECISION INSTRUMENT SPECIALISTS
2021 South Grand Ave. • Los Angeles 7, Calif.

CIRCLE INFORM-A-GRAM KEY NO. 1981

. . . New Method, from page 180

are first lifted from their storage racks by a one-man monorail hoist and loaded onto the carriages. The fixture-loaded carriages are then moved along the track through the detail stock bin area. Here the respective details are loaded into the fixture and secured in position. Next, the carriages are moved to the first automatic riveter where the angle stiffeners are riveted to the webs. The adjacent transfer gate then moves the unit assembly to the opposite track where five additional automatic riveting machines are positioned to perform specific riveting. The carriage unit is then moved into the cleanup area where work inaccessible or unadaptable to automatic riveting is performed. After completion of this operation, the work is moved to the end of the track where it is inspected. In inspection, the cycle checked fixture acts as a perimeter check gauge.

After inspection acceptance, the part is set on racks located just beyond the transfer gates. These racks become the free stock storage area for the final assembly operations. The carriages, with their empty fixture, are rolled onto the second transfer gate and moved to the opposite track. The monorail hoist then picks out the fixture, returning it to its proper storage spot, and selects another fixture to load on the carriage for another similar cycle.

Four adjustable trunnion stands are located alongside the bank of riveting machines. They are primarily for the assemblies unadaptable to automatic riveting but may also be used in cases of emergency. Jib booms are provided atop each automatic riveting machine for the quick removal of either fixture or carriages.

Time studies and test runs have effected the fabrication cost savings shown in Table III.

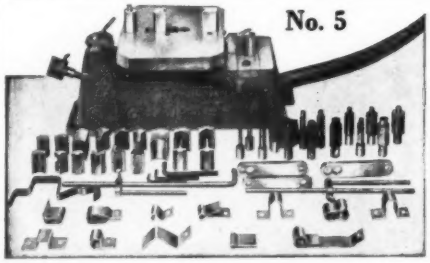
As production progresses, it is anticipated that familiarization, operational skills, and fabrication techniques will reduce fabrication time at least 25%.

Proving the Pudding

The actual proving of this method on a current contract is being observed with considerable interest by many, but particularly by Convair's manufacturing research and development section. Should the final cost records show evidence supporting this method, many potential uses can be foreseen. Sub-assembly operations are of particular interest. The substitution of this method for present manually performed operations of drilling, slotting, spotwelding, trimming, tapping, countersinking, etc., promise substantial reductions in fabrication time. The mechanization of these operations offer not only one of the greatest potential savings in airframe manufacture but will greatly increase the uniformity and quality of product.

It is not too improbable, in the near future, that sub-assembly machinery will be set up in long rows. Positioning equipment will move the work from one machine to the other, by-passing those not required in the specific operations.

This method is a definite contributor to efficient and low cost production. Continuing development promises still lower cost, thereby generating greater volume.



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CUTS, BENDS, PUNCHES

Available in hand or air operated models, the MULTIFORM is shipped complete with full assortment of dies and mandrels to form and cut round or flat stock up to 1/8"x1½" as illustrated. Punching and round end blanking dies available. Other models up to ¼"x6" air operated.

ALSO AIR OPERATED MODELS.

WRITE FOR DESCRIPTIVE CIRCULAR

J. A. RICHARDS CO.
KALAMAZOO, MICH.

CIRCLE INFORM-A-GRAM KEY NO. 1982

MEEHANITE® MOLDS

USED FOR...

Automobile Intrument Panel of Fiberglass. Shown by courtesy of Molded Fiberglass Body Co., Ashtabula, Ohio.

FIBERGLASS AUTOMOTIVE AND APPLIANCE PARTS

● Meehanite tops the list of cast mold materials for Fiberglass parts, because of its unique combination of physical properties.

It can be cast in intricate shapes with minimum finish.

The metal is clean and dense—there are no porous areas. It will take a high finish.

Trim edges can be flame hardened to outlast hardened tool steel inserts and you save the price of the inserts.

The castings are pressure-tight—no leakers.

The price of Meehanite castings is reasonable and deliveries are prompt. Not only that—but you can get castings in any size up to 20 tons in weight.

If you are interested in fiberglass or plastic molds or any other high strength iron application, let us discuss them in detail in a personal interview.

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EQUIPPED FOR HEAVY, MEDIUM OR LIGHT JOBBING PRODUCTION

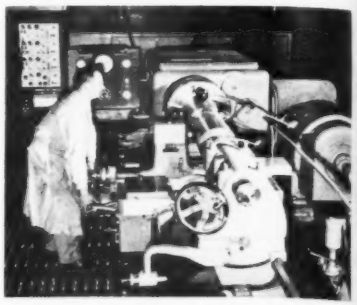
HEAVY JOBBING MACHINE SHOP—METALIZING

CIRCLE INFORM-A-GRAM KEY NO. 1983

SPECIALLY BUILT LATHE FOR CARBIDE TOOLING RESEARCH

Heavy cuts at high speeds are no problem with a new specially-built 125 hp, 32" LeBlond lathe installed recently in the machinability lab of Carboloy Department of General Electric Company, for widening the scope of cutting research. The lathe will be used to test materials machinability with various grades of cemented carbide tools, determine carbide life under all conditions and provide more information on speeds and feeds in machining with carbide.

The 12-ton machine transmits horsepower either through gearing or belting — 75 to 100 hp at the spindle through the former, and 100 to 140 hp with the latter. Infinitely variable speeds from 4 to 1,400 rpm are obtained through



a 125-hp variable speed unit.

Speed is maintained by electronic feed-back systems with less than 1% variation when a full load is applied. The drive unit can deliver 200 hp for long periods, will supply up to 350 hp before quitting. Complete instrumentation for machinability testing includes a high and low horsepower meter near the overload indicating lights. A work-riding tachometer permits continuous reading of surface speeds on a three-range instrument.

ASTM ISSUES TESTING LAB DIRECTORY

An up-to-date revision of the "Directory of Commercial and College Laboratories," formerly published by the National Bureau of Standards, is now available from the American Society for Testing Materials, 1916 Race St., Philadelphia, as the "Directory of Commercial and College Testing Laboratories." The two organizations have agreed that ASTM undertake the responsibility for compilation and publication of the Directory in the future.

The Directory gives information regarding the location of testing laboratories, together with the types of commodities and the nature of the investigations the laboratories are prepared to undertake. It is especially beneficial to the large number of purchasers who are not equipped to make their own acceptance tests and who therefore have hesitated to buy on specifications and also to manufacturers and others who are seeking testing laboratory services in the evaluation of raw materials and finished products.

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BIGGER
BIGGEST

another FLAME HARDENING
Problem Solved
at LAKESIDE

PROBLEM: To apply controlled, selective surface hardening to a rolling mill roll of 4,200 lbs., 8 feet, 2 inches long and 16 inches in diameter.

SOLUTION: Lakeside's Denver Universal Flame Hardener handles rolls up to 18 inches in diameter and 10 feet long, using a combination vertical and spinning motion, through scientifically controlled, multiple gas jet flames, to apply hardness to a uniform depth without appreciable distortion or scaling. PLUS — Lakeside's complete, modern material handling facilities to "baby" the giant roll through every step of its processing.

Our Services:

Electronic Induction Hardening, Carbonitriding, Flame Hardening, Heat Treating, Bar Stock Treating and Straightening (mill lengths and sizes), Annealing, Stress Relieving, Normalizing, Pack, Gas or Liquid Carburizing, Nitriding, Speed Nitriding, Aerocasing, Chapmanizing, Cyaniding, Sand Blasting, Laboratory Physical Testing.

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METAL TREATING INSTITUTE
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CIRCLE INFORM-A-GRAM KEY NO. 1985

GRC Fasteners

DIE CAST AT LOWER COST

Factual data on GRC's extensive line of zinc alloy fasteners for every industrial need . .

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CIRCLE INFORM-A-GRAM KEY NO. 1991

Sensational new *VIBRA-FORGE** principle assures unbreakable welds every time!

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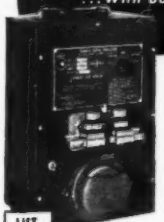
PORTABLE BAND SAW BLADE WELDER

...With Built-in Grinder

3/4" capacity



If you've been troubled with band saw blade breakage investigate this Bren/Weld unit built on the new Vibra-Forge principle. It gives you:

- PERFECT WELDS.
- NO BREAKAGE.
- NO FAILURES.
- WEIGHS ONLY 35 LBS.
- OPERATES ON 110 V, AC.
- UNCONDITIONALLY GUARANTEED.

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SALES DIVISION

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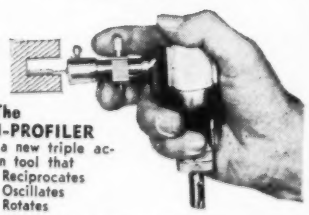
CIRCLE INFORM-A-GRAM KEY NO. 1992

DEAD END HOLES filed 50% FASTER with the Di-Profiler



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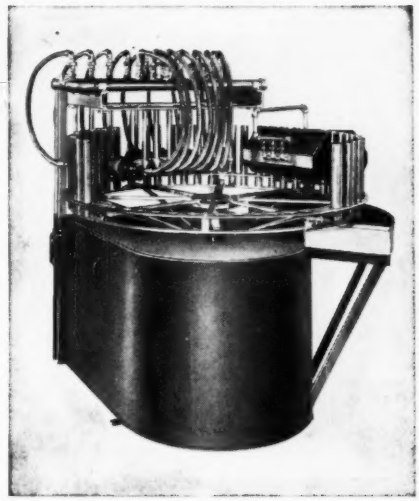

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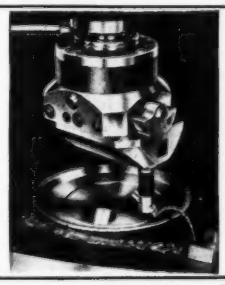

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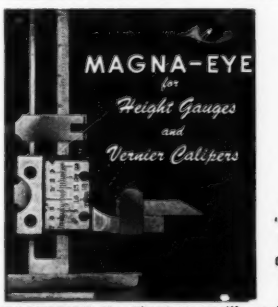

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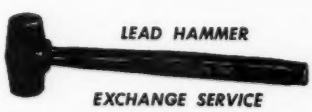

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CIRCLE INFORM-A-GRAM KEY NO. 2002

. . . Arbor Locates Parts, from page 66

To mount a workpiece on the arbor in readiness for turning is particularly simple and rapid. Washer (M) is withdrawn from shank (L) and the workpiece (X) may then be passed, large bore foremost, over nut (K) and placed over sleeve (E). Since the taper angle of hole (A) in all components is very accurately determined by reaming, each casting will fit very snugly upon the sleeve (E) of the arbor. While the casting is being mounted in this manner, sleeve (E) will be at its farthest right-hand position on the body of the device, due to the pressure of spring (J) and to the length of the elongated slot (F). As will be seen the casting is positioned about central to the shorter arbor sleeve situated within its bore.

To locate and clamp the workpiece in the required position for grooving, it is only necessary to replace washer (M) and tighten nut (K). As the nut moves towards the left, the workpiece (X) and sleeve (E) move in unison in the same direction along the body. This continues until the surface (E) Figure 1, of the casting is brought to bear against square shoulder face (N) on the body-flange (B), against which it is firmly clamped by nut (K).

When thus located and locked, endface of the casting is located the correct distance from the grooving form-tools (O) and (P), shown in light broken lines, which are fed only in a transverse direction across the lathe bed. Thus whatever variations may occur in the diameters of the bored tapered hole, or the over-all length of castings, the critical endface is always brought into the correct relationship to the pre-set form-tools to maintain distances (X) and (Y) to the desired fine limits.

By this means the form-tools remain unaltered in their setting throughout the machining of the full batch of castings, apart from occasional removal for sharpening, thus much setting time was saved, and stricter accuracy attained in the reproduction of the critically spaced grooves.

After completing the machining on the exterior of the casting, it is removed equally simply, merely by slackening the nut, withdrawing the washer and drawing the component off the sliding sleeve (E). Immediately the nut is released, spring (J) forces the sleeve (E) to the right thereby breaking the contact between endface of the workpiece and register face (N) on the arbor.

With all the working parts of the arbor suitably hardened, ground and precision fitted in place, a very long and accurate working life will be obtained.

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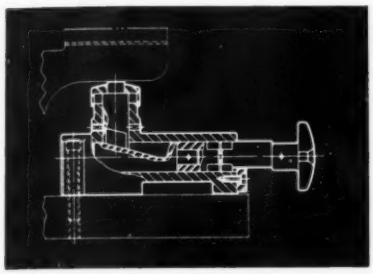

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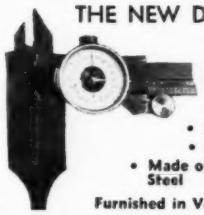

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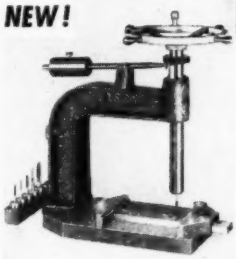

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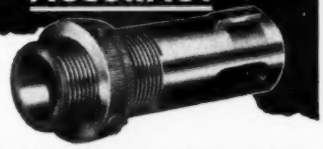

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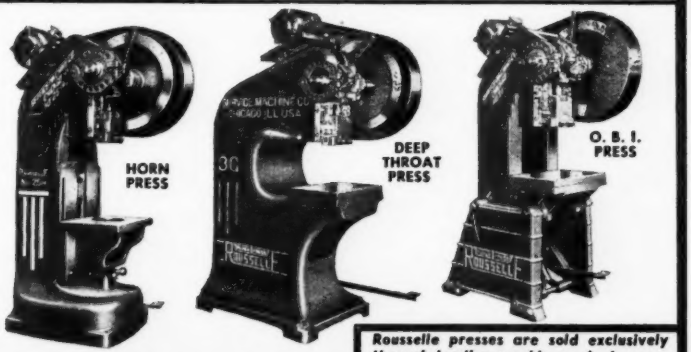

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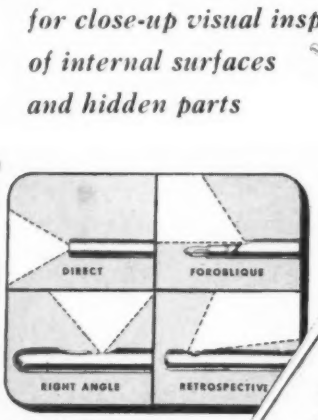

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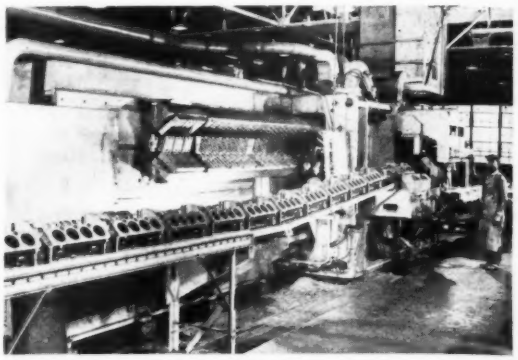
CIRCLE INFORM-A-GRAM KEY NO. 2022

. . . Segmented Automation, from page 64

tinuous automated lines, that of a single breakdown halting the entire line. Instead of one machine following closely on another, the machines are separated by conveyors that store up a reserve bank of engine blocks between



This huge automatic broaching machine leads off the Chevrolet engine block line.

them. Thus, while one machine is shut-down for repairs or tool changes, those following continue to run . . . working from the bank.

Eventually the Chevrolet plant will have four engine block lines, six cylinder head lines, and two final assembly lines. These multiple lines are being planned so that one line can go to the assistance of another in case of excessive machine trouble in any one section.

One of the first units in the engine block line is a giant Cincinnati broaching machine. An iron jaw lifts the block and clamps it against the multi-toothed broach. On the forward stroke, the broach roughs the bottom of the block casting. The block is then turned over and, on the return stroke of the blade, the two cylinder head faces are broached.

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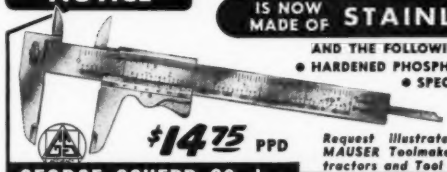

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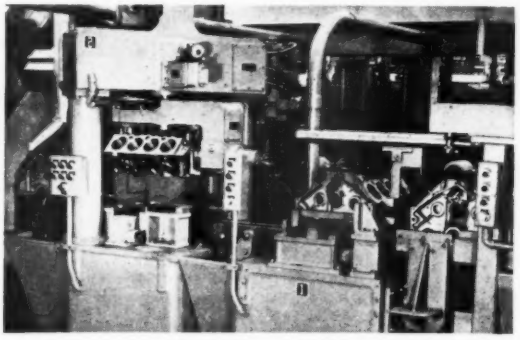
CIRCLE INFORM-A-GRAM KEY NO. 2041

. . . Sectionized Construction, from page 70

the goal of flexibility. The automated line is no longer stiff and rigid, the whole line shutting down for trouble at one point.

As a good example of this new concept, The Cross Company late last year delivered one of their Transfer-matics — this **one** being 350′ long and performing 555 operations on a steady



The secondary transfer mechanism on Section 1 delivers a part to the load station of Section 2. Behind each section, a bank of blocks is maintained to supply that section with work in the event that the preceding section is shut down.

stream of V-8 cylinder blocks. They are processed at the rate of 100 pcs/hr, with more than 100 pcs in process at one time.

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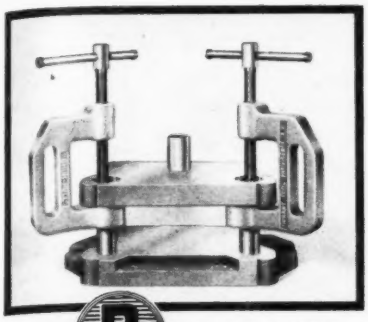

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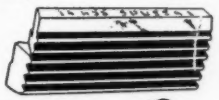

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Representatives in principal cities

CIRCLE INFORM-A-GRAM KEY NO. 2052

MODERN FORGED HIGH SPEED STEEL TOOLS ARE Guaranteed TO
✓ Last Longer
✓ Cut Faster
✓ Outperform
ALL OTHER HIGH SPEED TOOLS—

AND HERE'S THE REASON WHY!

Forging produces a stronger, better cutting tool than any other method for these reasons:

FORGING... increases impact strength!
FORGING... guarantees uniform hardness!
FORGING... controls grain flow!

A Conventional HSS tool. Maximum Rockwell 65.

Drawing A shows conventional high speed steel tool machined from blank. Note parallel grain structure which weakens tip of tool causing speedy breakdown of cutting surface.

B Forged HSS tool. Rockwell up to 69.

Drawing B shows same tool forged. Grain structure gives maximum strength, cutting is done with side grain guaranteeing increased tip strength, much longer tool life.

Forging by its very nature produces a tougher tool—the difference in Rockwell hardness possible by forging can by itself result in more than doubling tool life—and in addition the grain structure contributes overall tool strength—giving a far superior cutting edge for longer runs between grinds and finer finishes.

That's why we say MODERN Tools are *guaranteed* to outperform any HSS tool you are using now!

SEND FOR prices, literature and drawings on many standard Forged Tools available—send specifications for quotations on special forged tools!

DO IT TODAY!

NELCO TOOLS
MODERN TOOLS DIVISION
NELCO TOOL CO., INC., BERLIN, CONN.

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(This Space, 1" deep, costs $12.00 per insertion). A depth of ½" costs $6.00 per insertion. Sold on 12 time insertion basis only. TOOLING and PRODUCTION, 1975 Lee Rord, Cleveland 18, Ohio.

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CAMS— ALL TYPES
to your specifications
Write for bulletin—NO OBLIGATION
SHAKER TOOL and DIE CO.
9823 Bessemer Ave., Cleveland 4, Ohio

. . . Carbide Milling, from page 72

brazing process by which the carbide is fastened to a steel shank; intermittent heating and cooling during the cutting process—a condition much accelerated in the milling process because of the frequency of heating and cooling; or stresses developed in grinding and sharpening.

Mechanical impact or stressing most generally results from the forces developed and released during initial contact with, and exit from the work. This condition, too, might be amplified because of harmonically developed impulses.

From the foregoing it can be seen that many of the cutting material requirements are not necessarily compatible. Briefly, the requirements are:

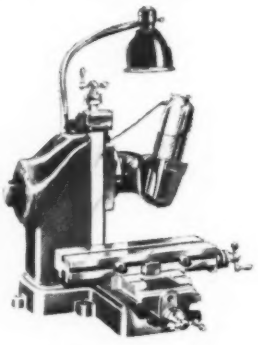
1. High Strength
2. High Hardness
3. High Thermal Conductivity
4. Low Frictional Characteristics
5. Uniformity of material

Certain applications may necessitate greater consideration of one than another of the above. To aid in the selection of the best material when cutting conditions and probable limiting factors are or have been determined, the analysis shown in the accompanying table may be used to advantage.

Precise®
HIGH R.P.M.
MILLING MACHINE

UP TO 45,000 R.P.M. AND ½ H.P.
FOR LOW COST SMALL PARTS MILLING

The first . . . the ONLY Universal Milling Machine with the speeds and sensitivity needed for precision small parts milling with tungsten carbide and other midget mills. Parts for watches, radio, TV, automobiles, aircraft—virtually any small part made of steel, brass, aluminum or plastics can be milled in production in less time to tolerances as close as .0001". PRECISE Heavy Duty Power Quills ride on four micro-precision bearings with sealed-in lubricant. Built-in Control provides speed settings between 15,000 and 45,000 R.P.M. Complete line of accessories and cutting tools is available for unlimited versatility.



CONDENSED SPECIFICATIONS
Table Working Surface, 4" x 12"
Table Travel, 5"
Transverse Travel, 3"
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LOW COST AUTOMATIC
STOCK REEL
COSTS NO MORE THAN STANDARD STOCK REELS
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3 SIZES — ALL WILL TAKE 6" WIDE STOCK.
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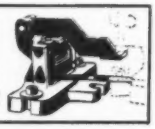
Guaranteed — money back if not 100% satisfied

New LOW prices on the JACO 3-inch and 6-inch SCRAP CHOPPER



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Dealer Inquiries Invited

JACO DEVICES, INC.
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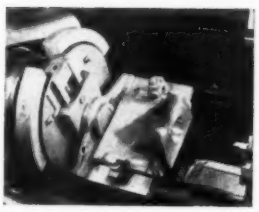
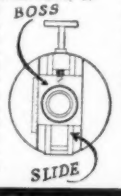
SLASH TOOLING COST, TIME
FOR ANY MACHINING JOB
DIFFERENT NEW WORK-HOLDING TOOL DOES AWAY WITH "CUSTOM" TOOLING



The machining job shown at left was set up ready-to-run in less than 15 minutes — by using the patented MICRO-CHUCK all-purpose work-holding tool! MICRO-CHUCK can handle almost any shape work piece (within certain size limits) at a fraction of usual tooling cost and time, and AT NO SACRIFICE IN PRODUCTION SPEED OR ACCURACY! MICRO-CHUCK is precision made, for precision work. Basis of MICRO-CHUCK is the universal face plate, to which inexpensive, standard work-holding fixtures are attached. Patented feature* permits firmly locating work in any position with two simple adjustments! Use on lathe, grinder, boring or milling machine, drill press, etc.

*Patented work-locating feature: Work is mounted on one of numerous inexpensive work-holding attachments; assembly is then fastened to BOSS on face plate, on which it can be fixed in any position in complete 360° circle. BOSS in turn moves up or down on SLIDE, thus permitting work to be brought to and locked in exact spindle center with only two adjustments. No shims needed.



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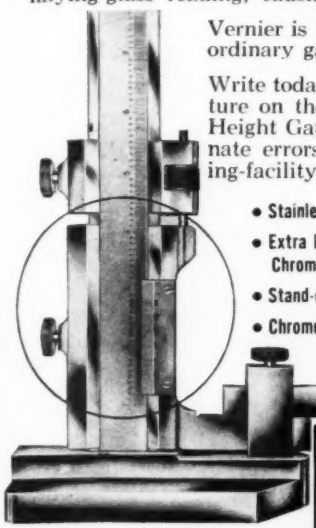
No more squinting, tilting to avoid reflection, magnifying-glass reading, causing undue eye-strain.



Vernier is 1.225 or twice that of ordinary gauges.

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Sizes: 12" to 48"

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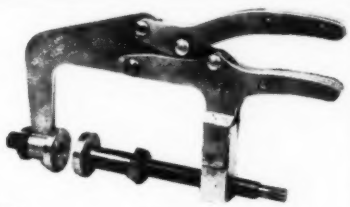

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FEATURES:
Balanced Design
Instantaneous Release
Positive Gripping Control

A Complete Line of Toggle Action Clamps for Woodworking, Sheet Metal and Welding.
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Accuracy 001" - No Distortion
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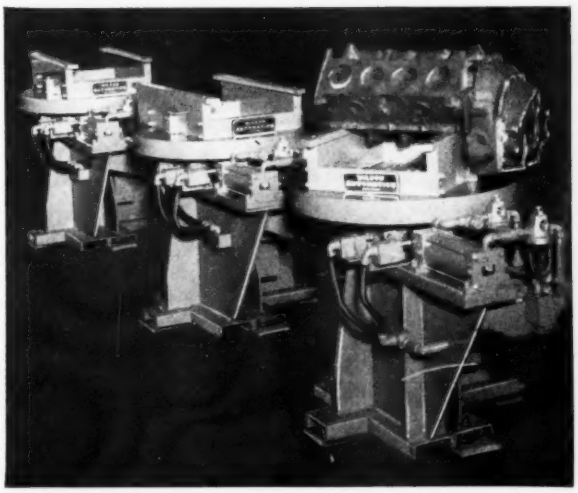
AUTOMATION by WILSON



Wilson Standard Automation Units

A battery of Wilson standard turntables used to orient engine blocks between machining operations. These units are employed in conjunction with Wilson standard transfer shuttles which, when used together, provide automatic materials handling.

Wilson designed Automation installations are constantly extending the use of Automation methods to more and more production processes. We will be glad to discuss with you how Automation can be applied profitably to your specific operations.

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WILSON AUTOMATION COMPANY

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CIRCLE INFORM-A-GRAM KEY NO. 2074

. . . Carbide Parts, from page 80

Feed Ratchet

This feed ratchet, which is solid Kennametal Grade K1, is synchronized with the knocker dies. It indexes on each stroke of the knockers to feed the stock into position for setting the teeth. Pitch of the ratchet teeth corresponds with pitch of the saw being set. Since this requires changing ratchets for various pitch stock, the comparative data presented below are based on footage instead of time. The original Kennametal ratchet is still in operation and considering the amount of wear to date, should run another several million feet before being replaced.

	Oil Hardened Tool Steel	Kennametal K1
Initial cost	$ 35.00	$ 88.22
Total life of ratchet	100,000 ft.	6,000,000 ft. (to date)
Number of ratchets for 6,000,000 ft. of production	60	1
Cost of ratchets for 6,000,000 ft. of production	$2,100.00	$ 88.22
Savings with Kennametal on six million feet production (ratchet cost only)		$2,011.78

Knocker Dies

The knockers slide in-and-out from both sides, upsetting the saw teeth on each stroke. Length of stroke and angle on the knockers determine the degree of tooth set. These dies are made of solid Kennametal Grade K6. Both ends can be used before regrinding is necessary. Their previously-used knockers were high-speed steel.

	High Speed Steel	Kennametal K6
Initial cost (one set)	$ 35.00	$ 53.32
Number of days in operation per grind	5	260
Number of grinds per life of set	26	100 (est.)
Total life of dies	½ year	100 years (est.)
Grinding cost per year	$125.00	$2.40
Downtime cost per year to reverse and adjust	$126.00	$2.40
Die cost only per year	$ 70.00	$0.53
Total cost per year	$321.00	$5.33
Estimated savings per year with Kennametal		$315.67

The foregoing applications are typical of results obtained when Kennametal is used as wear-resistant parts. They may suggest possibilities for applying Kennametal to other wear-spot problems to help reduce costs and improve products.

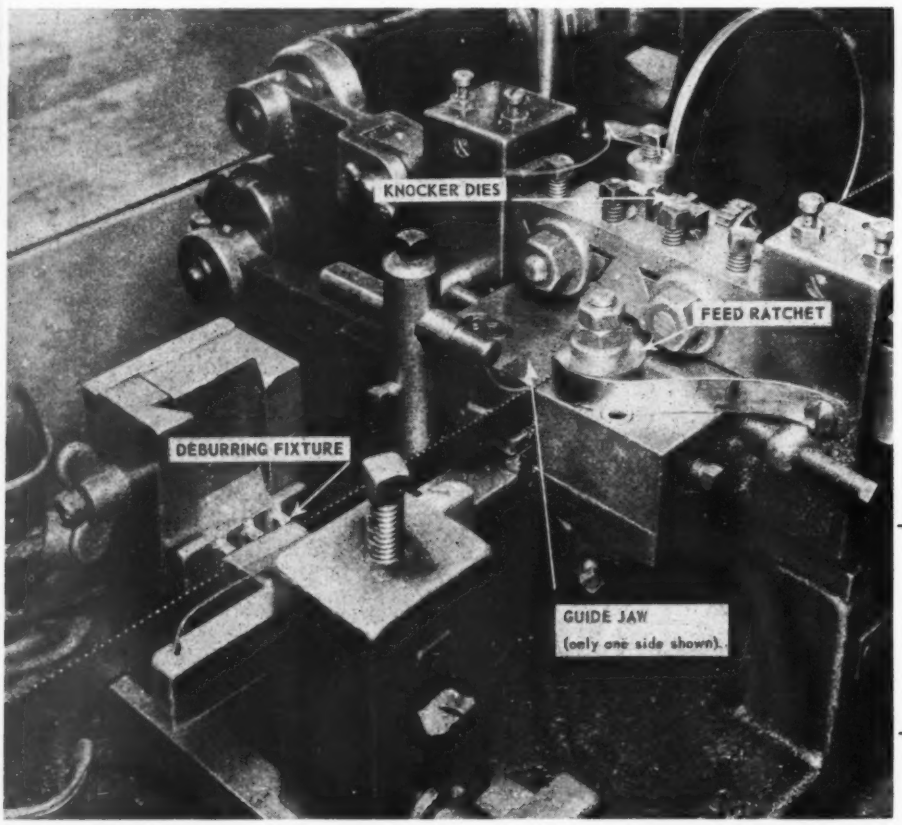


Fig. 2. A band saw tooth setting machine is shown set up with the location of the carbide wear parts indicated.

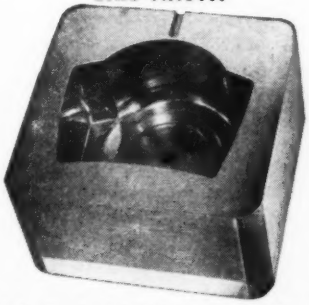
WANT TO *ELIMINATE* SCALE, PITTING, DECARBURIZATION LIKE THIS...

USE

PHOENIX BRAND

TRADE MARK REG U.S. PAT. OFF.

NON-SCALING COMPOUND FOR MIRROR-BRIGHT RESULTS LIKE THIS...



Originally devised for use in the Parker plant, Phoenix Brand non-scaling compound is now used throughout industry for the safe, sure protection of heat treated steels hardening up to 1650°F. This dry, easily handled powder is sprinkled on. It then forms a hard air-tight shell during the heat treating process. As the atmosphere is sealed out—scale, pitting or decarburization is impossible—and every piece emerges from the furnace clean and shiny. There are no rejects! No hours of costly polishing! Furnace capacity is materially increased with the elimination of cumbersome packs. Protective shell breaks off when water quenched; a short boiling in plain water removes coating when oil quench is used. Phoenix Brand non-scaling compound is recommended for use in *all* furnaces except bath type.

2 lb. can $ 6.00
5 lb. can 15.00
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Cost Cutting Versatility

This precision turret lathe will cut your machining costs on small parts. Built-in accuracy, ease of operation and a wide range of speeds and feeds insure high production and close tolerances. Practical attachments simplify tooling the lathe for jobs which might otherwise require special fixtures. What's more, your least experienced operator will soon be a top producer on the 1000 Turret Lathe — it's that easy to run. Write for catalog . . . also information on 9″ to 16-24″ Lathes, 7″ Bench Shapers and 14″ Drill Presses.

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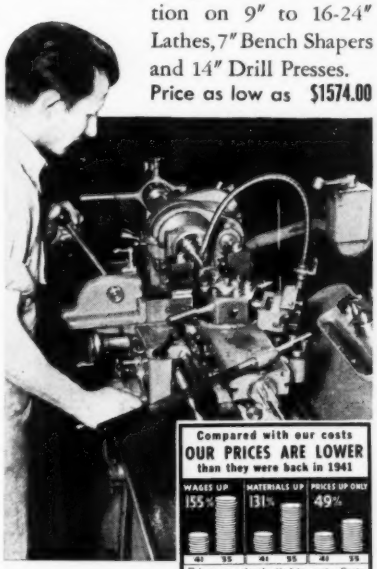
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OUR PRICES ARE LOWER
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WAGES UP
155%
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49%
Prices are closely tied to costs. Costs are still rising. Buy now before increased costs necessitate higher prices.

SPECIFICATIONS

Swing — 10⅛″; Turret to Spindle — 19¾″; Collet Capacity — 1″; Spindle Bore — 1⅜″; Spindle Speeds — 12, 50 to 1357 r.p.m.; Power Longitudinal Feeds — 70, .0007″ to .0836″; Power Cross Feeds — 70, .0003″ to .0303″; Thread Cutting Feeds — 70, 4 to 480 per inch.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906

SOUTH BEND LATHES

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PRECISION BORING WITH MAXWELL MASTUR TOOLS

• Adjustable to 0.0002-inch, the new improved MASTUR boring tools feature precision, speed and long service life. New body and block construction permits these tools to take heavier cuts at higher speeds—to do more work in less time.

Adjusting-screw head is graduated into 50 divisions to provide readings in thousandths, and body is graduated to permit vernier readings of 0.0002-inch. The three models available have maximum boring bar capacities of 1/2, 3/4 and 1-inch and boring range from 3/8 to 15 inches.

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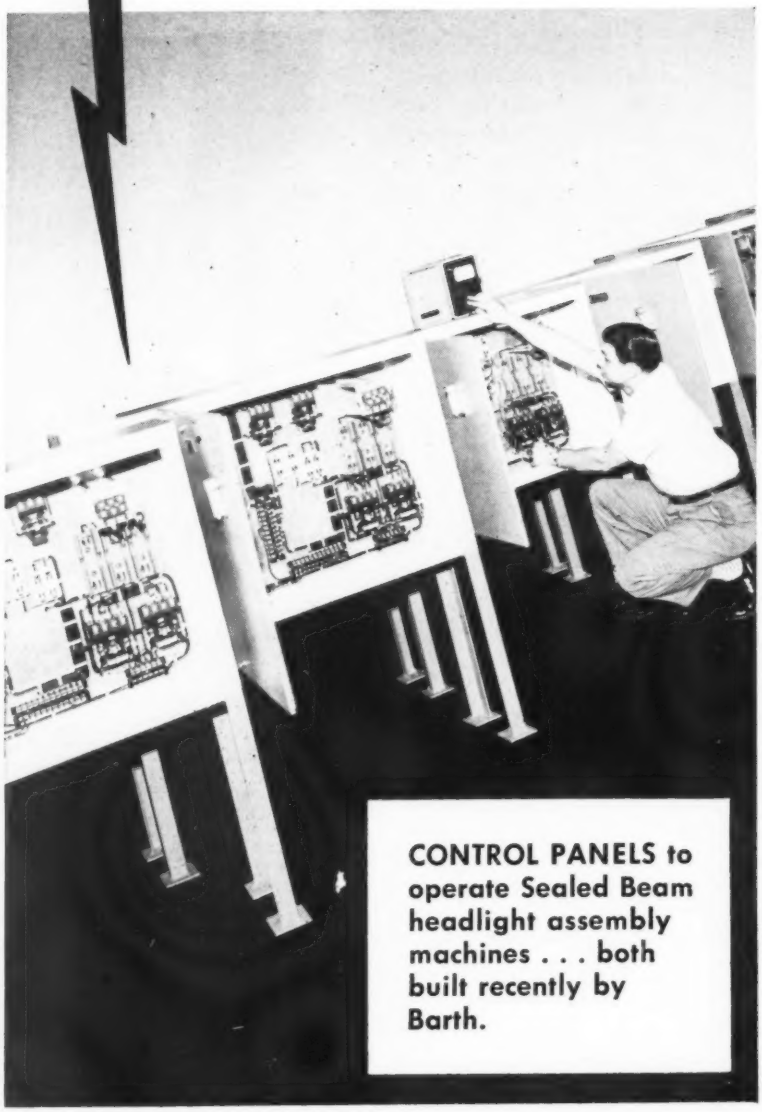

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A High Honor To The N T D M A

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The NTDMA, whose executive secretary is George S. Eaton, won the Grand Award for associations in the middle-size class. Their entry was based on the association's apprenticeship training program, and emphasized the important part played in the program by the color movie which depicts the strategic importance of the tool and die industry to mass production, and national defense.

In this all-important training field, the NTDMA's aggressive and increasingly successful efforts have included cooperation with high school officials and o t h e r educational authorities; also the use of color films, local conferences, booklets, training courses, direct mail publicity, and special programs by each of the 21 local associations in the tool and die industry.

—*E.W.P.*

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Setting boring cutters to within 0.00025″ of the desired cutting position is simple with the direct reading tool position indicator developed by Euclid Instrument Co., 743 E. 232 St., Cleveland 23, Ohio. The patented gage consists of a micrometer spindle-and-dial indicator combination mounted at the end of an extension bar pivoted from a bracket attached to the machine frame.

. . . *Continued on page 212*

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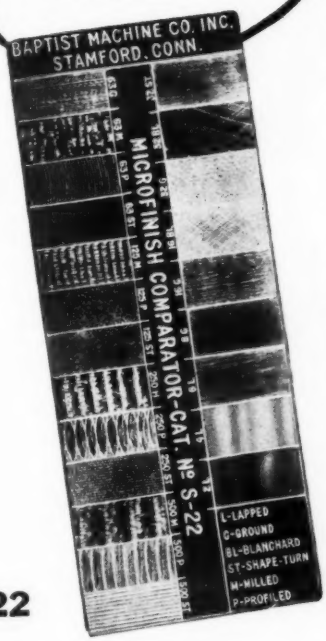

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Because:

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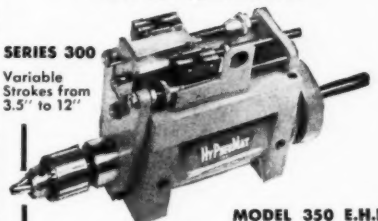
Variable Strokes from 3.5" to 12"



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3½" Stroke
⅜" Drill Cap. in Steel
⅜" Tapping Cap. in Steel

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Stepless Speeds from 500 to 6000 RPM.
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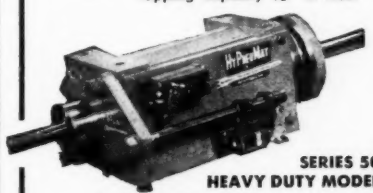

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Built for heavy duty drilling and tapping.
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Automatically inspects diameter; rejects misfits.

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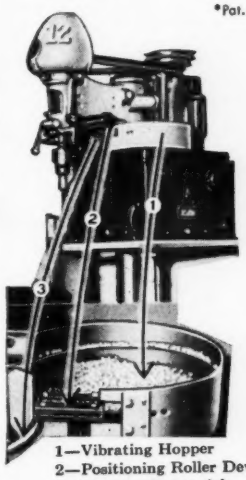
*Pat. Pend.



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392 Capitol Ave.
Hartford, Conn.

CIRCLE INFORM-A-GRAM KEY NO. 2121

STAR STAINLESS SCREW CO.

CORROSION RESISTANT

Telephone: LIttle Falls 4-2300
679 Union Blvd., Paterson 2, N. J.
Direct NEW YORK Tele. WI 7-9041

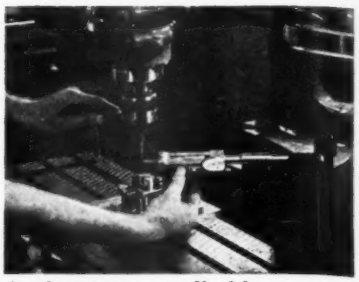
CIRCLE INFORM-A-GRAM KEY NO. 2122

. . . Position Gage, from page 210

Any desired cutting radius is set directly on the micrometer spindle, and the gage is swung into position so that the projecting spindle anvil contacts the cutter point.

The spindle anvil thus becomes, in effect, an indicator point. Any deviation of the cutter from the exact micrometer setting chosen is registered by the indicator needle.

The new gage gives a built-in position indication and eliminates the need for long lists of



sized cutters, toolholders, gages and other accessories, making possible the production of exact size holes on the first pass.
Circle Inform-A-Gram No. D3.

The May issue of

TOOLING AND PRODUCTION

will be the . . .

8TH ANNUAL QUALITY CONTROL ISSUE — *Don't miss it!*

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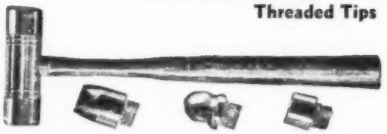
PLASTIC-TIPPED MALLETS
with Replaceable (by hand) Threaded Tips



Now you can effectively avoid marring metal and plated finishes! Use Southwest Plastic-tipped Mallets . . . the only plastic mallet with the threaded tips replaceable by hand. Plastic tips . . . solid alloy head threaded at both ends . . . non-sparking . . . non-magnetic! Since 1939 Southwest has led the field. Send today for illustrated literature and low prices.

Send $1.00 for sample prepaid mallet.

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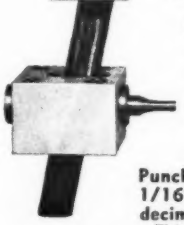

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OCTOCAM pays for itself through savings in toolmaking time.
All parts hardened and precision ground.
Punches available from 1/16" to 1/2" in any decimal size required.
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OCTAVIA TOOL & GAGE CO.
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CIRCLE INFORM-A-GRAM KEY NO. 2124

CAMS
To Your Specifications
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— Except Screw Machine Cams —
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Design Assistance Offered
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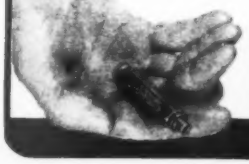

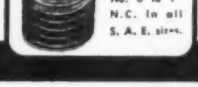

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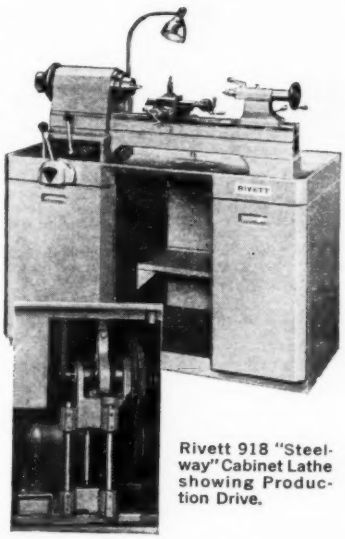
Here is the *faster*, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench —no other tools needed. Get more work *now*—save money too!

HEIMANN MFG., CO. • URBANA, OHIO

CIRCLE INFORM-A-GRAM KEY NO. 2126

CABINET LATHE FEATURES EASE OF OPERATION

The improved 9" swing precision cabinet lathe announced by Rivett Lathe & Grinder, Inc., Boston, Mass., features the option of a production drive permitting one-operator motion for multiple functions and a variable drive for instant selection of any speed from 90 to 3750 rpm.

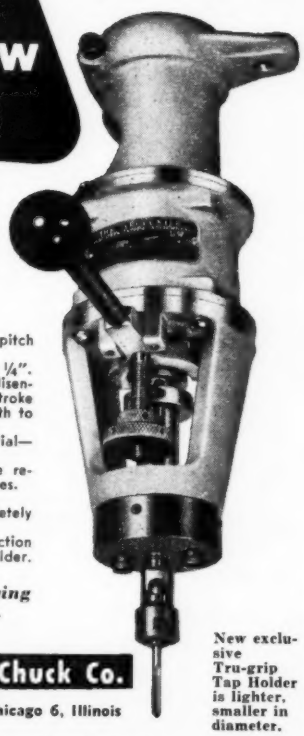


Rivett 918 "Steelway" Cabinet Lathe showing Production Drive.

Ease of operation is also obtained by improved work-holding methods and well-grouped controls for operator efficiency, greater capacity, and higher production. A lever chuck reduces efforts to a minimum, 1⅛" capacity draw-in collets mount directly in the spindle mouth, stationary collets have no "in" or "out" motion, and step chucks provide accurate holding of circular or irregular parts. The lathe has a self-aligning slide rest which squares itself automatically with the line of centers.

New LEAD SCREW TAPPER

Accuracy and Quality Beyond Comparison!



This new lead screw tapper performs with miraculous accuracy . . . maintains uniform precision threads easily . . . all the time! Here's the secret: the tap is fed gently, easily, automatically without any pressure on the tap itself—it's completely controlled by the lead screw which guides the tap steadily, quickly, accurately—without variation—ever!

Check these facts:

- Produces uniform threads in any pitch from 20 to 80!
- Finger tip "trigger arm" travels only ¼".
- Positive depth stop automatically disengages clutch at top and bottom of stroke without overrun; holds uniform depth to within .005".
- Tap capacity 0" to ¼" in soft material—0" to ⅜" in steel.
- Entire lead screw assembly can be replaced in seconds for varying pitches.
- Lead screw travel 1-⅜".
- Almost all parts spoilage completely eliminated.
- Has famed Procunier cork faced friction clutch and exclusive tru-grip tap holder.
- Can be air operated.

Write for FREE Brochure giving full details and specifications.

New exclusive Tru-grip Tap Holder is lighter, smaller in diameter.

PROCUNIER Safety Chuck Co.

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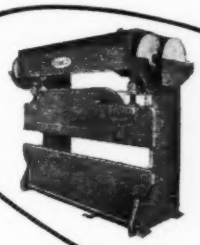
FULL RANGE OF FORMING PRESS BRAKES BY SEMCO



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Send for NEW catalog illustrating newest models of Press Brakes and including Standard 90 Carbon Forged Steel Press Brake Dies.

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SERVICE MACHINE CO., INC.

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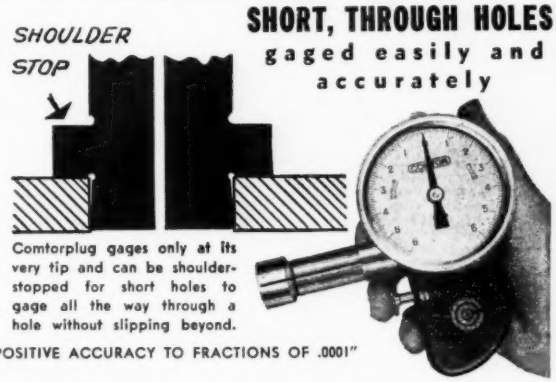
SHORT, THROUGH HOLES gaged easily and accurately



Comtorplug gages only at its very tip and can be shoulder-stopped for short holes to gage all the way through a hole without slipping beyond.

POSITIVE ACCURACY TO FRACTIONS OF .0001"

COMTORPLUG with interchangeable expanding plugs to gage simple or special bores from 1/8" to 8" dia.

UNIQUE ADVANTAGES

Positive gaging accuracy to fraction of .0001" regardless of who operates it.

Indicates actual size, a fixed—not passing—reading.

Positive 2-point gaging—automatic centering.

Shallow holes, deep holes, inside splines, open-end holes gaged easily.

Detects ovality, back or front taper, bell mouth, barrel shape.

Reaches to bottom of blind holes. Gages work while still held in chuck.

A shop tool for all-day every day use.

Portable — no wires, hoses or stands.

Investigate the gage used by the thousands in jet engine, guided missile, farm machinery, automotive transmission, household appliance, and other volume-precision plants. IT MAKES PRECISION GAGING EASY . . . at machine . . . at inspection bench . . . for selective assembly. No other like it—investigate and see why.

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to solve press obsolescence problems

The extensive capital expenditures required to meet competitive pressures have put many manufacturers in an unfortunate position. Modernization is necessary if the manufacturer is to price his product competitively and still make a fair profit. However, the fair profit is necessary before he can afford the modernization. Two new Verson plans make it possible to modernize now and pay for it out of the increased profits it provides. If you are one of the manufacturers faced with the dilemma of needing modernization for better profits, but needing better profits before you can afford modernization, one of these plans may be the answer to your problems.

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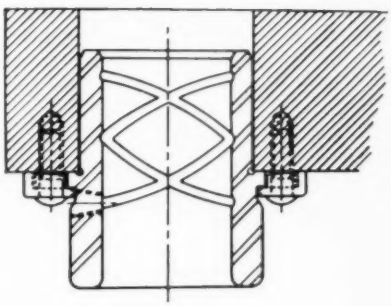

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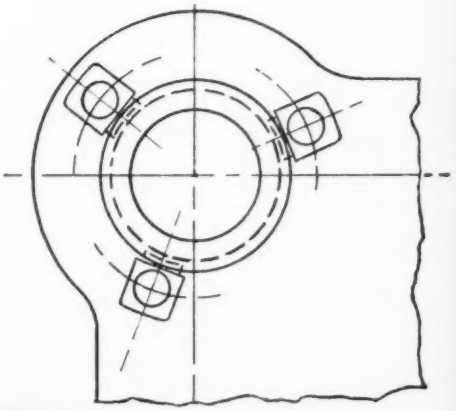

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